Ontario

THE ECONOMIC FUTURE OF THE FOREST PRODUCTS INDUSTRY IN NORTHERN ONTARIO

Prepared by
Lakehead University

the ROYAL COMMISSION on the NORTHERN ENVIRONMENT

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Ontario

Royal Commission
on the Northern
Environment

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From the Office of
the Commissioner

STATEMENT FROM THE COMMISSIONER

The mandate of the Royal Commission on the Northern Environment directs me "to inquire into any beneficial and adverse effects on the environment...for the people of Ontario of any public or private enterprise, which, in the opinion of the commission, is a major enterprise north or generally north of the 50th parallel of north latitude...." This Commission's research and public participation program is governed by my two overriding concerns, first that development in this part of Ontario take place in an orderly and beneficial manner in concert with the environment, and secondly that northerners are involved in making decisions about developments that affect them.

Timber operations associated with the forest products industry, a major northern enterprise, are continuing to expand northwards into the southern part of Ontario north of 50°. Harvesting of hitherto unexploited stands will extend to areas farther north as forest management plans are implemented. Moreover, proposals for one major new undertaking in a vast area to the north of Red Lake are now under consideration. The prospect of the industry's expansion into Ontario north of 50° has generated controversy about the need for additional wood supplies and the associated social, economic and natural environmental consequences. Although these issues are of central concern to this Commission, not all of them are addressed in the report that follows.

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The Commission undertook this economic study of the forest products industry in order to establish broad external perspectives and insights that could be injected into its other research and public participation activities for Ontario north of 50°. Two main objectives were defined. The first was to explain the present structure of the industry in northern Ontario and the reasons for that structure. The second was to portray a series of possible and probable futures for the sector in northern Ontario generally and Ontario north of 50° in particular, through examination of the factors influencing it.

This study should be of interest to all groups and individuals concerned about the north as well as to those who have a direct stake in the future of the forest products industry. It is of particular value to this Commission to the extent that it provides authentic insights concerning the nature, scale and location of likely forest industry activity in the remote north. However, it is not our intention to make basic recommendations concerning the structure of the industry; such recommendations clearly lie beyond the mandate of the Commisssion.

Nor was this study designed to investigate the economic, social and natural environmental consequences of further expansion of the industry into Ontario north of 50°. Such expansion would pose special problems and raise a host of contentious issues. The southern part of Ontario north of 50° contains the northern fringe of potentially productive forest land and the largest unexploited timber stands in the province. Beyond this fringe area, natural conditions become marginal for timber growth and, especially, regeneration of the forest after harvesting. Moreover, any northward expansion of forestry activities into this area will impinge increasingly on the resource base for tourism and such traditional activities as commercial trapping, fishing and living off the land. Finally, native people and other people inhabiting the area are concerned that they would be unable to secure any significant part of the benefits flowing from new forest industry development.

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These resource allocation, resource management, and socio-economic issues came to a head in the mid - 1970's, when Reed Paper Limited began to examine the prospects for establishing an integrated forest products complex in the Red Lake area using timber from a tract of 19,000 square miles to the north. Public furor over the proposal to utilize the unexploited forests in this tract led to the establishment of this Commission and gave impetus to the initiation of planning by the Ministry of Natural Resources in the West Patricia area.

This Commission's mandate requires me to examine potentially fruitful approaches resolving these and other issues. Because I consider that such issues can be addressed most appropriately through intensive and widespread public involvement, I am about to embark upon a program which will give the public the essential information base required. To formulate my recommendations to the Government of Ontario, the program will also provide all interested groups and individuals with opportunities to bring forward to the Commission their own viewpoints, insights and information.

This research report forms an essential component of that program, I encourage you to read it and invite you to comment on it. In order to reach an even wider audience, I intend to distribute a summary of this report in English, French, Cree and Ojibway.

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ACKNOWLEDGEMENT

Staff of Lakehead University in Thunder Bay carried out the research and wrote this report. This work was greatly enhanced by the experience, information and advice generously provided by members of the Advisory Committee that I established in order to ensure that the perspectives of the federal and provincial governments and the forest products industry were fully considered. I wish to thank them for their contribution. Because of the diverse interests represented, I did not expect the members to reach consensus on all the information and conclusions presented in this report. Accordingly, I offered to incorporate members' letters expressing divergent views in an appendix to the report.

The Royal Commission on the Northern Environment actively solicits public response and commentary on all aspects of its research and public program.

Commentary, critique and review are welcomed on The Economic Future of the Forest Products Industry in Northern Ontario. A Summary of Public Response to this report is scheduled for public release in April, 1982.

THE ECONOMIC FUTURE OF THE FOREST PRODUCTS INDUSTRY IN NORTHERN ONTARIO

Prepared for:

THE ROYAL COMMISSION
ON THE NORTHERN ENVIRONMENT

by:

LAKEHEAD UNIVERSITY

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The Advisory Committee, made up of representatives from the forest products industries, industry consultants, the federal government (Departments of Regional Economic Expansion and Industry, Trade and Commerce) and the Government of Ontario (Ministry of Natural Resources), read drafts of this study and offered a great deal of advice.

Officials of the Canadian Pulp and Paper Association, the Ontario Lumber Manufacturing Association and the Ontario Forest Industry Association provided information and suggestions.

Representatives of a number of companies involved in lumber production and representatives of a major pulp and paper company provided specific information on various aspects of the study, as did officials of the Department of Industry, Trade and Commerce, Ontario Ministry of Natural Resources and the Ontario Ministry of the Environment. Officials of the United States Bureau of the Census were exceedingly helpful in making data - and the interpretation of that data - available to us.

Prof. J. Blair, School of Forestry, Lakehead University, offered at our request his professional and expert advice on Chapter 4.

For the Royal Commission on the Northern Environment, Mr. Ian Fraser, Director of Research, offered helpful advice and constructive criticism during the preparation of this report. Ms. A.E. Daley helped to establish the terms of reference for this study, facilitated the research, and organized the meetings of the Advisory Committee.

The conclusions reached in the study do not necessarily reflect the views of any individual member of our Advisory Committee.

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PREFACE

This study seeks to identify the major problems and prospects facing the important sectors of the Northern Ontario forest products industry. The past development of Northern Ontario has been highly dependent on these sectors as evidenced by the number of communities in which employment is largely or entirely dependent upon the presence of pulp and paper mills and sawmills. Table P-1, drawn from a recent Ontario government report on the pulp and paper industry, illustrates the critical role that this industry plays in community structure in the northern areas.

Three specific sectors are identified as having crucial significance to Northern Ontario: newsprint, kraft pulp, and lumber manufacture, together with their associated logging operations.

Chapter 1 describes the structure of these sectors, their economic development in North America, and previously published treatments of their relative regional cost positions. Chapter 2 concentrates on Northern Ontario's market destinations for newsprint, kraft pulp, and lumber and describes the price formation mechanisms characterizing these products. In Chapter 3, detailed estimates of Northern Ontario's manufacturing and transport costs are presented and compared with costs in other areas of Eastern Canada and the southern United States. These cost comparisons are presented both for existing manufacturing facilities and for investments in entirely new capacity. Chapter 4 examines Northern Ontario's wood supply position in relation to current (1980) requirements and includes a geographically disaggregated discussion in which supplies in the less accessible areas of Northern Ontario are identified and related to harvesting pressure. The final chapter pulls together the analyses of markets, costs, and wood supplies to examine plausible rates of return on new investment, the wood supply constraint on new investment, and the viability of existing manufacturing facilities in Northern Ontario.

English units are used in the report, reflecting predominant practice in the North American industry. The Glossary contains conversion factors to International Units.

Table P-1

IMPORTANCE OF PULP & PAPER COMPANY EMPLOYMENT TO COMMUNITIES IN ONTARIO

Scale	Community and Percentage of Its Total Employment in Pulp & Paper Co. Operations	Number of Employees* Residing in Community/Elsewhere	Company Name(s)
	Smooth Rock Falls 62.5	550/120	Abitibi
60			
	Marathon 57.9	620/250	American Can
50	Iroquois Falls 50.2	1200/310	Abitibi
	Terrace Bay-Schreiber 48.6	800/930	Kimberly Clark
	Red Rock-Nipigon 44.4	750/230	Domtar
40			
	Kapuskasing 39.5	2300/125	Spruce Falls, Kimberly Clark
	Dryden 38.4	1200/400	Reed
	Espanola 33.7	970/530	Eddy
30	Fort Frances 29.7	1200/20	Boise Cascade
20			
	Kenora-Keewatin 17.3	1175/85	Boise Cascade
	Sturgeon Falls 15.5	420/-	Abitibi
	Hawkesbury 11.1	550/-	Canadian International Paper
10	Thunder Bay 10.0	4900/890	Great Lakes, Abitibi
	Cornwall 7.2	1400/-	Domtar
	Napanee 4.9	220/-	Strathcona
	Thorold-St. Catharines 3.0	2500/-	Ont. Paper, Abi., Domtar, Beaver, Kimberly-Clark
	Huntsville 2.3	100/-	K.C.
	Trenton 1.9	290/-	Trent Valley, Domtar
0	Sault Ste. Marie 1.6	500/150	Abitibi
	North Bay 1.0	200/-	Nordfibre
	Brantford 0.9	300/-	Sonoco
	Ottawa 0.3	580/-	Eddy
	Toronto-Peel-Halton 0.1	1250/-	Cont. Can; Rolland, Domtar, Atl; Reed, Dom. Cell; IKO; Abitibi

*Includes pulp and paper mills, and integrated sawmill and logging operations.

Source: Ontario Ministry of Industry and Tourism (1978).

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EXECUTIVE SUMMARY

NORTH AMERICAN LOCATIONAL TRENDS

Structure Of The Northern Ontario Forest Products Sector

Northern Ontario can be defined approximately as that part of the province north of 46° latitude. As such, the area corresponds closely to the system of northern planning regions set out by the Ministry of Treasury, Economics, and Intergovernmental Affairs and to the four Northern Administrative regions employed by the Ministry of Natural Resources.

Northern Ontario pulp and paper capacity amounts to nearly 12,500 short tons per day of which 80 per cent is newsprint or dried kraft pulp. There are no dried kraft pulp mills in Ontario outside the northern area and only one newsprint mill (drawing on Northern Ontario wood) is located south of 46° latitude.

Most of Ontario's lumber is sawn in the northern area. Sawmills specialize in softwood lumber, principally 2x4's, with most of the hardwood lumber industry located outside Northern Ontario.

Newsprint, kraft pulp, and lumber manufacture are resource-oriented activities. Chemical pulping involves a 50 per cent or greater dry weight loss from roundwood or pulp chips so this process is clearly oriented to the forest rather than to the markets for kraft products. Lumber production involves conversion of roundwood, generally spruce and jack pine, into lumber and wood chips. The latter, with a low value to weight ratio, find local markets where the pulp mills are located so sawmilling is forest-oriented. Without chip sales, lumber production would involve an even greater loss of bulk from roundwood, again dictating a forest location.

Since wet (or slush) pulp is over 90 per cent water, paper production can only practically be separated from pulp production if the latter is converted to dried pulp, baled, and re-pulped at the paper mill site. The costs of drying, baling, and re-pulping can be obviated if paper is manufactured at the same location as the slush pulp. Paper production is, therefore, drawn to the forest resource.

Regional Production And Capacity Trends

Canadian *newsprint* capacity has declined relative to United States capacity since the appearance of the U.S. South producers in the 1950's. Faced with slow growing continental markets for its exports and southern competition, Ontario's capacity has been virtually static since the early 1960's. Other Canadian regions grew during the 1960's but growth has since levelled off.

Canadian *kraft pulp* capacity has grown very rapidly in competition with rapid expansion in the United States South. Most of Canada's growth has been in British Columbia, but other provinces, including Ontario, have participated to a lesser degree. Part of central Canadian growth reflects the very rapid increase in consumption of kraft paper products compared to newsprint even though Ontario and Quebec have been exposed to direct competition in dried kraft pulp sales from B.C. producers.

Canada has been the fastest growing area in North America in *lumber* production but, again, virtually all the growth has taken place on the west coast. Until the late 1960's, central Canadian production was quite static. Since that time, production in Ontario and Quebec has nearly doubled in the face of buoyant consumption. As with kraft pulp, Ontario competes directly in markets served by the two most expansive North American production areas: B.C. and the U.S. South.

Comparative Regional Costs

The U.S. South and the North American west coast regions have experienced lower newsprint production costs than the eastern Canadian provinces. Their cost advantage would be even larger if transportation costs were added to reflect movements of newsprint into 'traditional markets'; this is particularly so in comparisons between the U.S. South and Ontario.

Kraft pulp production has been substantially less costly on the west coast and in the U.S. South than in eastern Canada.

The information for softwood lumber costs suggests that the U.S. South and the interior areas of the west coast region experience somewhat lower production costs than central Canada.

MARKETS AND PRICES FOR NEWSPRINT, KRAFT PULP AND SOFTWOOD LUMBER

Newsprint

The ratio of regional exports of newsprint to the United States to regional newsprint capacity gives a fairly clear picture of the relative export orientation of Canadian areas. The Atlantic provinces have the lowest ratio (.48) reflecting a substantial - and not unexpected - orientation to European markets. Quebec and British Columbia, with ratios of .73 and .72 reflect Canada's *average* trading pattern (the Canadian ratio is .72). Ontario, with a ratio of U.S. exports to capacity and production of .89, can be presumed to be almost entirely reliant on the U.S. market.

Ontario supplies about 16 per cent of United States newsprint demand, a ratio that has remained more or less stable during the 1970's. Our regional shares vary from 40-45 per cent of midwestern markets down to a very small, and variable, share of western U.S. markets. About 10 per cent of U.S. northeastern consumption is sourced from Ontario.

In 1978, 74 per cent of Ontario's exports went to the midwestern states, 16 per cent went to northeastern states, 7 per cent to the U.S. South, and 3 per cent to the western region of the U.S. In rough terms, the midwestern U.S. is dependent on Ontario for about half its newsprint consumption, while Ontario ships about three-quarters of its exports to those states. The major links are to the states of Michigan, Ohio, Illinois and Wisconsin.

Based on the data available, it is very probable that Ontario's share of northeastern and midwestern markets has declined over the last two decades. Ontario's share of *eastern* Canadian capacity (Canada excluding British Columbia) has fallen from 30 per cent in 1959 to 24 per cent in 1979.

Within North America, three semi-official pricing areas for newsprint prevail: the U.S. East Coast, with the list prices set at New York; the U.S. West Coast; and the prices quoted by some producers in the southern U.S. which can be lower than the New York list price. New York list prices are the relevant ones for Ontario producers.

European newsprint prices can and do diverge from North American east coast prices as well, reflecting higher costs of production in Scandinavia. Since U.S. southern producers have played a minor role in European markets, the link between North American and European prices rests in the pricing and output strategies of producing companies in the Atlantic provinces and Quebec.

The North American pricing system takes the form of price leadership. Most newsprint is sold under contractual arrangements. Production in eastern North America and in eastern Canada is relatively concentrated. The publishers with whom the producers deal are also relatively concentrated and, in a number of cases, are integrated backwards into newsprint capacity.

The rapid growth of the U.S. southern industry placed downward pressure on North American *real* newsprint prices from the late 1950's to the early 1970's. The Canadian price leaders have been forced to recognize the cost advantages of U.S. rival producers and, by holding price increases close to variable cost increases in Eastern Canada, have attempted to respond to shifting regional cost patterns. Relatively low profitability for Canadian producers, slower capacity expansion, reduced market shares, lower and more variable operating rates have all been symptomatic of the pressures of the past two decades.

Market Kraft Pulp

Commodity flows in the woodpulp sector exhibit less geographical segmentation than for newsprint. European markets are much more important for Canadian producers of woodpulp, relative to U.S. markets, than for newsprint, and the North American market cannot be divided into areas of eastern and western influence.

British Columbia, largely confined to U.S. west coast markets for newsprint, is a dynamic force in Europe and eastern North America in the area of wood pulp sales; and this pattern, together with substantial U.S. west coast pulp flows to eastern North America and the important position of the U.S. southern states in European markets, means that pulp prices are tied together internationally. One cannot speak of a North American - much less an eastern North American - price of pulp without referring to the price in western Europe.

The relatively strong European orientation of Canada's kraft pulp trade is not shared by Ontario producers. In 1979, Ontario pulp mills produced nearly 2 million short tons of kraft pulp of which 1.3 million short tons were shipped to non-integrated paper mills and of the latter shipments, only 33,000 short tons or 2.5 per cent were to European destinations. The other 97.5 per cent of Ontario kraft pulp shipments went to affiliated and non-affiliated paper mills in North America, mostly in the United States. Over 80 per cent of market pulp produced in Ontario for sale in North America moves to United States destinations. Of the almost 2 million short tons produced in 1979, 84 per cent was in the bleached and semi-bleached categories.

Based upon aggregation of U.S. Census data, it is reasonable to assume that 58 per cent of Ontario's woodpulp shipments to the United States went to midwestern destinations, mostly in the states of Michigan, Ohio, Illinois, Indiana, and Wisconsin; another 32 per cent moved to northeastern states, principally New York, New Jersey, and Pennsylvania; the remaining 10 per cent of Ontario's woodpulp shipments went mostly to U.S. southern states. Owing to the pre-eminent position of kraft pulp in woodpulp total shipments, it is reasonable to assume that these flow patterns fairly represent the U.S. regional destination pattern for kraft pulp.

From 1950 to 1978, woodpulp production in the United States increased from 15 million to 50 million short tons, while Canadian production increased from 8.5 million short tons to 21.6 million short tons. The southern states were largely responsible for the rapid U.S. relative growth rate; while most of Canada's growth is traceable to capacity increases in British Columbia.

From 1972 to 1978, Ontario has been able to maintain its share of Canadian woodpulp exports to the United States rather well. At the same time, however, Canadian woodpulp shipments to the United States grew more slowly (9.25 per cent from 1972 to 1978) than total U.S. woodpulp production (11 per cent over the same period). On an overall basis, Ontario's share of the 1972 total was 24.9 per cent and had declined only slightly to 24.3 per cent in 1978.

From 1966 to 1975, Canada increased its share of European bleached kraft pulp imports from 15 per cent to 32 per cent, the U.S. increased its share from 16 to 19 per cent, while the Scandinavian share of European imports fell from 69 per cent to 49 per cent. This is the type of behaviour to be

expected as low cost producers - the U.S. South and British Columbia - move to secure domestic markets and then reach out to attract more distant customers from higher cost competitors, placing downward pressure on prices in the process.

In all likelihood, the 1980's will see a continuation of the trend toward increasing North American shares of European pulp imports.

Price formation in the sulphate pulp sector is closer to the competitive ideal than in newsprint. This is partly because there are a larger number of producers in North America than in the newsprint sector and partly because North American and European producers compete actively enough to eliminate any major international price differentials (adjusted for transportation costs). Like newsprint, a large fraction of woodpulp is sold on a contractual basis for up to ten years duration.

U.S. import prices for bleached kraft pulp from Canada exhibit more flexibility than contract prices though the latter, unlike newsprint contract prices, can and do decline in response to conditions of excess supply.

The real price of woodpulp in the United States has not exhibited any noticeable upward trend since the war though frequent erratic movements are present. Sharp changes in price in this sector are to be expected since market pulp supplies can swing widely: increases in mills' own use or shipments to affiliated paper mills during periods of buoyant demand for paper products will sharply reduce pulp available for sale, while weakening paper markets will have the reverse impact.

A mixed impression of the possible real wood cost behaviour in the 1980's emerges. British Columbia and the U.S. South will probably continue to act as cost-leaders in European markets though it is improbable that British Columbia's share of European pulp imports can expand at historical rates. The existence of available wood supplies in the low-cost North American regions suggests that there is no reason to assume that real pulp prices will embark on a rising trend in the 1980's. Therefore, the current price for contract deliveries of Canadian kraft pulp to the United States may at least offer a guide to the medium term returns available to producers in Ontario (in real terms).

Lumber

In North America, British Columbia and the U.S. southern states enjoy the lowest wood costs and the former produces high-quality lumber. As a result, among the Canadian provinces, over 95 per cent of lumber exports from Canada to overseas destinations are from British Columbia. For all intents and purposes, Ontario manufacturers do not export lumber overseas.

British Columbia also dominates the U.S. market for Canadian softwood lumber with 80-85 per cent of shipments. In contrast to overseas markets, however, Ontario and Quebec send significant volumes to the United States.

From the Northern Ontario perspective, U.S. lumber markets essentially mean markets for spruce and jack pine.

As a high wood cost region, it is to be expected that Ontario would have a limited market 'reach' in the U.S. and Canada compared, for example, to British Columbia; this is borne out by available statistical information. Northern Ontario sawmillers report that their most important urban lumber markets are Toronto, Detroit, Chicago, and Minneapolis. In general, lumber produced in Northeastern Ontario (the Hearst-Chapleau region) tends to move to Toronto, Detroit, and Chicago, while production in Northwestern Ontario goes to Chicago and Minneapolis.

Considering a market structure continuum, lumber markets can be assumed to be at the perfectly competive end. In lumber markets, large numbers of independent buyers face large numbers of independent sellers so that all parties face prices that are distinctly beyond their control.

Recent studies suggest real pulpwood prices have remained constant for a century while real sawlog prices have risen in real terms. The relative increase in sawlog vs. pulplog prices means that these two sources of fibre have to be considered as separate natural resources: logs of an adequate size for pulping are not necessarily large enough to be sawn. Since the logging process itself is similar in both cases, it is fair to infer that resource depletion is taking place for sawlogs as trees in the larger size categories and more accessible locations are used up. Since up to 40 per cent of lumber costs can be attributed to the cost of the raw material, rising real sawlog prices account for most of the upward trend in deflated lumber prices.

From the viewpoint of sawmillers, long-term trends tend to fade into insignificance in comparison to the short-run instability of lumber prices. Up to 40 per cent of lumber shipments find their way into housing construction, with the balance used in non-residential construction, manufactured products, wood pallets, containers, dunnage, blocking, and bracing. Studies of the demand for lumber are fairly unanimous in agreeing that its short-run price elasticity is low (less than unity).

Inelastic supply and demand responses in lumber markets - as with agricultural products - mean that fluctuations in the demand for lumber stemming from shifts in the timing and magnitude of investment expenditures on housing and other components of capital formation translate into sharp fluctuations in price. This introduces an element of risk into the lumber industry.

The 1970's have witnessed nearly two complete cycles in U.S. residential construction activity: investment and U.S. lumber prices rose from mid-1970 to peaks at the end of 1972. Prices and activity declined until late 1974 or early 1975 and then started up again to a peak in 1978, with subsequent declines reflecting the Federal Reserve Board's tight money policy. The Toronto price has followed the U.S. northeast cycles with a slight (six month) lag. This cyclical relationship between lumber prices and U.S. housing activity has been evident for a long period.

Exchange Rate and Price Projections

An exchange rate of $0.85 (U.S.) to $0.90 (U.S.) for the Canadian dollar seems a fair representation of near-term prospects. If Canadian costs outstrip U.S. costs (or *vice-versa*), the exchange rate would have to compensate. However, not everyone will agree with the $0.85 (U.S.) to $0.90 (U.S.) range; therefore the results of this study's rate-of-return analysis are reported for an exchange rate range from $0.80 (U.S.) to $1.00 (U.S.).

The delivered price assumptions carried over to the study's rate of return analysis are as follows:

Newsprint - $375 (U.S.) to $400 (U.S.) per short ton in 1980 dollars;

Kraft pulp - $435 (U.S.) to $465 (U.S.) per short ton in 1980 dollars;

Softwood lumber - $195 (U.S.) to $230 (U.S.) per Mfbm in 1980 dollars.

MANUFACTURING COSTS

The Production of Newsprint: Existing Capacity

The estimated cost of producing newsprint with existing capacity in the various regions is shown in Table 3.6.

Mills located in Northern Ontario have a significantly higher variable cost of production than do mills in the U.S. Southeast. The three categories in which costs are significantly higher are wood, labour and transportation. With respect to labour costs, very little of the cost disadvantage is due to the *current* level of labour rates. The bulk of the difference in labour costs is due to the very large difference in the vintage of the capital equipment between the two regions. The recently announced plans of some major producers to replace existing paper machines in Northern Ontario mills with modern high speed machines will certainly lead to a reduction in labour inputs and thus - given an assumption that wage rates in the two regions increase at the same percentage level - lead to a narrowing of the labour cost differential. At present levels of labour hourly earnings, a reduction of 3 man hours per ton for a mill currently requiring an input of 8 man hours per ton will lead to a reduction in labour costs of almost $40 per ton.

Wood costs in Northern Ontario are, for most producers, higher than those in Quebec and, for all producers, higher than those prevailing in the U.S. southeastern states. Clearly, part of this difference is due to the fact that labour costs in logging in the U.S. Southeast are substantially lower than those prevailing in Northern Ontario.

Eastern Canadian producers face an $8 to $10 CDN disadvantage per ton in transportation costs as compared with shipments originating in the U.S. South.

The Production of Newsprint: New Capacity

The estimated costs of manufacturing newsprint with greenfield capacity are given in Table 3.8.

The estimated operating costs of producing newsprint in greenfield capacity show that costs differ across regions in three important categories: wood costs, energy costs and transportation costs.

With respect to wood costs, the highest cost is experienced in Northern Ontario. Northern Ontario producers can be expected to face a disadvantage of $27 to $30 CDN per ton of newsprint compared with U.S. Southeast states' wood costs.

Energy costs are lowest in Quebec and highest in the U.S. Southeast. Producers in the Southeast can be expected to pay $40 CDN more for purchased energy per finished ton than will Quebec producers and $23 CDN more per finished ton than will Northern Ontario producers.

Producers in the Southeast U.S. will face transportation costs that are $8 to $10 CDN lower than for producers in Quebec and Ontario.

The Production of Dried Bleached Kraft Pulp: Existing Capacity

Table 3.12 presents summary information on the cost of producing softwood bleached dried kraft pulp with existing capacity. Only producers that are broadly representative of regional capacity have been included.

It is believed that the majority of firms in Northern Ontario have manufacturing costs (excluding depreciation but including transportation costs) in the range of $360 to $390; for Quebec producers, the comparable range would be $350 to $390; and for the majority of producers located in the U.S. Southeast the range would be $300 to $330 CDN.

Wood costs per air dry ton of pulp are $60 to $65 CDN higher in Northern Ontario than in the U.S. Southeast.

The Production of Dried Bleached Kraft Pulp: New Capacity

The cost of manufacturing softwood bleached dried kraft pulp is summarized in Table 3.13.

Most locations in Northern Ontario will experience higher production costs than would be faced in Quebec and the U.S. Southeast states. With greenfield capacity, a location in the U.S. Southeast offers a large saving in wood costs per air dry ton of pulp compared with locations in Ontario and Quebec. The majority of other costs are, however, broadly comparable.

Lumber Manufacturing Costs: Existing Capacity

Table 3.14 presents summary information on the cost of manufacturing lumber in Northern Ontario. It can be seen that mills producing in the range of 60 to 70 million board feet a year have a clear cost advantage over mills producing in the 18 to 20 million board feet range.

For mills producing 60-70 million board feet a year, located in the Hearst-Chapleau region, the cost of production (excluding depreciation) plus transportation will equal $193 to $208 per thousand board feet.

For mills of similar size in the Thunder Bay area, the comparable range of costs is $203 to $218, whereas for mills located in the extreme northwestern portion of the region the cost will be $207 to $217.

The cost of producing lumber is extremely sensitive to net wood costs (equal to wood costs minus the sale of chips).

Most of the differences in the cost of producing a specific lumber product across regions will be due to differences in net wood costs and to differences in transporting the product to major markets.

Lumber Manufacturing Costs: New Capacity

Specific cost information on new lumber manufacturing capacity was obtained directly from a number of existing regional producers and equipment suppliers. Summary costs are given in Table 3.15.

Industry sources have indicated that capital costs will be higher for sawmill locations north of latitude 50° compared with locations in existing large to medium size communities. The major reasons for this are the added cost of transporting equipment and materials to the site, the lack of support facilities and ready availability of construction trades, weather restrictions and general isolation costs.

The capital costs for an 18 to 20 and a 60 to 70 million board feet mills are substantially above those which would arise if the sawmill were integrated into pulp mill or paper mill.

For an 18 to 20 million board feet mill, the capital cost for the sawmill integrated into a pulp or paper complex would be around $5 million as opposed to a $7.35 to $7.9

million cost estimated for the sawmill alone. For a 60 to 70 million board feet mill, the estimated cost would be approximately $15 million as opposed to the $18.35 million to $19.5 million estimated for an independent mill.

Comparison of Lumber Manufacturing Costs in Other Regions

An analysis of available data indicates that there are offsetting advantages and disadvantages in production costs in the various regions.

Because Northern Ontario producers, for the most part, have modern mills of optimal scale, labour productivity is high. Thus, even though wage rates are in excess of those prevailing in Quebec and Southeast U.S. mills, labour costs per thousand board feet are roughly comparable with those in other regions, with the U.S. Southeast producers enjoying a $3 to $5 CDN advantage over Northern Ontario producers, and Northern Ontario producers in turn enjoying a similar advantage over B.C. Interior and Quebec producers.

Northern Ontario producers face higher net wood costs than do producers in the B.C. Interior, Quebec and the U.S. Southeast. However, the recent large increase in chip prices in Northern Ontario has reduced the net wood cost disadvantage to some extent.

The higher production costs in Northern Ontario will clearly limit the ability of Northern Ontario producers to market their output over as large a geographical region as producers located in low cost regions.

WOOD SUPPLIES IN NORTHERN ONTARIO

Allowable Cuts and Fibre Requirements in Northern Ontario

Direct comparison of net fibre requirements with the annual allowable cuts for the province *suggests* the presence of surplus wood in Northern Ontario on the order of 1.3 million cunits of softwood and 3.4 million cunits of hardwood. This conclusion would be far too optimistic, however. There are several reasons to believe that currently reported annual allowable cuts are more or less inaccurate and *seriously overestimate* the actual supply of fibre available to the industry on a sustained basis at present levels of logging utilization and softwood-hardwood fibre proportions for pulp and lumber. These reasons are as follows:

- Accelerated plus liquidation harvesting means that current AAC's are not sustainable to the year 2000.
- Withdrawals of productive forest from wood production will materially affect fibre supplies.
- Allowable cuts on harvested areas are not fully removed in the logging process.
- Forest Resource Inventory-based estimates of allowable cuts tend to overstate realized allowable cuts.
- Management plans are frequently outdated and incomplete, particularly for Order-in-Council licenced areas.
- Annual allowable cuts will include acreage that has not been adequately regenerated following harvesting.
- Aggregate comparisons of fibre supplies and requirements for Northern Ontario as a whole may mask specific regional aspects of wood availability.

The present state of information available on Ontario's wood supplies is not sufficiently precise to give assurance that allowable cuts accurately estimate volumes of merchantable wood available even if the productive land base assumptions and utilization standards assumed in annual allowable cut calculations are correct. The absence of approved management plans for many management units and the preliminary nature of the Forest Resource Inventory volume calculations mean that allowable cuts are probably overestimated - to an uncertain degree - *before* making allowance for withdrawals of production land and underutilization of annual allowable cuts in the logging process. The AAC calculations assume a level of utilization that is not being achieved and, even if the utilization level assumed in AAC calculations was achieved, AAC's will decline as accelerated removals lower AAC's to the sustained levels in the future. As a result, fibre supplies are not only insufficient to support additional manufacturing capacity, they are inadequate to support existing capacity without major improvements in utilization.

The Ministry of Natural Resources has commented on the tightening wood supply situation in Northern Ontario, a concern echoed by the Ontario Economic Council (1976).

The Forest Resources Group of the Ministry of Natural Resources is in the process of redefining allowable cuts in terms of the reduced production forest base. At the same time, wood requirements have increased sharply during the 1970's. There is no doubt that the Ministry's planning framework has been strained as a result. Accurate allowable cut measures

related to specific geographic areas and the relationships of allowable cuts to actual wood supplies are much more important in 1980 than in 1970 - the intervening growth of fibre requirements greatly intensifies the need to define the limits of sustainable supply over the near future.

Regional Considerations

The problem of wood scarcity is most acute for softwoods since 90 to 95 per cent of current wood needs are for these species, and the relation between requirements and supplies is tightest for softwoods in the province as a whole. For Northern Ontario as a whole, the ratio of softwood requirement to softwood allowable cut is, at present, 82 per cent.

The Northwestern region has a requirement to allowable cut ratio of 88 per cent; however, if the argument concerning the limitations of allowable cut figures as indices of fibre supplys is accepted, existing requirements exceed supplies at present utilization levels. Wood supplies are tightest in the North Central region where the ratio of net requirements to annual allowable cut is 100 per cent. In the Northern region, net requirements relative to the allowable cut are lower than in Northern Ontario as a whole - 75 per cent. The only region of Northern Ontario in which adequate wood supplies appear to be present is the Northeastern region. Here, the ratio of softwood net requirements to annual allowable cut is 24 per cent compared to the Northern Ontario average of 82 per cent.

With the exception of the Northeastern region, the extremely tight supply situation is characteristic of each of Northern Ontario's administrative regions. Of particular concern is the close relationship between net requirements and allowable cuts in the large and important North Central region and the localized sawlog supply shortages now apparent in the Northern region.

Supplies in the Vicinity of 50° Latitude

Present requirements are being drawn very largely from the more accessible forested areas of the province, and the 50-North region has not yet been the object of substantial exploitation.

Ontario's forest products industry will have to reach increasingly into the 50-North region with resulting increases in the mill costs of fibre to sustain present needs.

Of the total 50-North allowable cut of 5.72 million cunits per year, 3.53 million or 61 per cent is in the Northwestern region and it is here that the relationship between current harvests and wood supplies is most favourable. In contrast to the North Central and Northern regions where over half the softwood allowable cut goes into harvest volumes, the ratio of harvesting to softwood AAC is less than 30 per cent in the Northwestern area of the 50-North region.

The forest products industry in Northern Ontario has concentrated its harvesting efforts in the more accessible locations. The industry is faced with possible wood shortages in the not-too-distant future (immediately if AAC's were to be revised downward to reflect the *sustained* supply) and with rising wood costs as the margin of harvesting is extended into the more remote areas.

Policy Considerations

The emerging overall shortage of fibre in Ontario and the gradual pressure to shift cutting activities into less accessible areas should serve as justifications to re-examine several aspects of Ontario forest policy, three major issues being: incentives to fuller utilization of allowable cuts; adjustments of allowable cuts to reflect actual productive forest acreage allocated to industrial use; and the effect of rotation periods on wood supply.

Economic incentives could be applied which would raise utilization across all species and to place a particular premium on the use of hardwoods in pulp furnish and lumber manufacture. In addition allowable cuts on licenced areas could be reduced to reflect the actual utilization standards practiced on those specific licences. The new Forest Management Agreements (FMA's) will assist in the achievement of better utilization since the companies themselves must face the problems for regeneration stemming from excessive logging slash and unused trees on their cutover areas. Also, there appears to be scope for increased use of hardwoods in pulping and lumber manufacture if incentives are present to do so.

In addition to efforts to improve general utilization, the Ministry of Natural Resources will have to reduce AAC's where productive forest land has been reduced. For softwoods at least, shortages will surely appear under these circumstances, and such shortages will impose timber allocation problems on the Forest Resources Group as and

when they arise. These shortages can be dealt either through the rise of a rationing or quota system or through a pricing system.

The rotation periods currently in effect for Ontario species are based on silvicultural and product considerations. These rotations, however, need not be viewed as immutable - maximum sustained yield rotations could be shorter; financial rotations might be considerably shorter - although there could be significant cost and/or supply implications. The present overestimations of supply by annual allowable cut calculations that exaggerate fibre availability do not contribute to the goal of coping with scarcity and will only make the needed adjustments *more* difficult in the immediate future as depletion becomes more obvious and pressing.

ECONOMIC PROSPECTS

The final chapter takes a deliberate look at the prospects for newsprint, kraft pulp, and lumber.

Rates of Return on New Investments

Rates of return in Northern Ontario are examined in relation to capital costs. A computer program was developed to examine prospective internal rates of return on hypothetical greenfield investments under alternative assumptions about the Canadian dollar exchange rate, price developments for the major products, operating rates, and cost trends. The results of the investment analysis appear in Tables 5.6 through 5.11. With the exchange rate in the $0.85 to $0.90 (U.S.) range, greenfield investments in newsprint and bleached kraft pulp manufacturing can achieve satisfactory rates of return in relation to the real cost of capital in Ontario. With the same exchange rate range, new investments in softwood lumber manufacturing capacity offer rates of return that barely cover capital costs. In addition, volatile prices for lumber produce special investment risks in this sector.

The foregoing conclusions to the rate-of-return analysis are framed in the context of real wood costs in Ontario rising more rapidly than in the past.

The Wood Supply Constraint

The important impediment to new capacity, therefore, is the scarcity of sustained wood supplies in the province. The

existing demand-supply situation requires a restraint on mills' wood demands. *Net* additional manufacturing capacity should only be installed if existing facilities can be adapted - through higher pulping yields, wood chip use, or greater hardwood utilization - to free up wood currently required by the industry at 'normal' operating rates.

Cost Problems For Existing Mills

Existing mills in Northern Ontario *do* face cost disadvantages in spite of the generally satisfactory rates of return to incremental capacity just mentioned. With respect to the production of newsprint from existing capacity, the reasons for the higher cost of production in Northern Ontario are threefold. First, and the area over which producers have greatest control, is the level of labour costs. The majority of mills in Northern Ontario require significantly more labour input per ton of newsprint than do mills in the U.S. Southeast. In order to reduce required labour inputs to a more acceptable level, large capital expenditures are required. Second, wood costs in Northern Ontario are considerably in excess of those enjoyed by newsprint producers located in the U.S. Southeast. The third major source of higher costs for Northern Ontario producers is the cost of transporting newsprint from the mill to the market.

Producers of dried bleached kraft pulp located in Northern Ontario are at a cost disadvantage compared with producers located in other major producing regions. The reason for this is almost solely related to differences in wood costs. The ability of Northern Ontario producers of kraft pulp to achieve reductions in components of cost other than wood cost is, in general, more limited than is the case for newsprint producers. Much of the reason for this is that the bulk of kraft pulp capacity in Northern Ontario is of relatively modern vintage.

All Northern Ontario (and U.S.) pulp and paper mills will be required to invest significant amounts of capital over the next ten years for pollution abatement procedures. Pollution abatement standards faced by American mills are considerably more stringent than those placed on Ontario mills.

For sawmills in Northern Ontario with a capacity of 60 to 70 million board feet a year, production costs are higher than those faced by efficient producers in British Columbia

and the U.S. Southeast. The major cost problem is that of obtaining an adequate supply of sawlogs at a net wood cost that does not lead to uneconomically high production costs.

Viability of Existing Capacity

The fact that Northern Ontario is a high cost location for the manufacture of newsprint, dried kraft pulp, and lumber does not necessarily preclude the continuing viability of existing capacity. Over the life length of the fixed capital assets employed in production processes, existing producers will continue to remain in operation as long as revenue is sufficient to cover all of the variable costs. Replacement of existing capacity will only be undertaken if investment in new plant and equipment promises an adequate rate of return on capital.

Given the assumed range of market prices for newsprint and kraft pulp, it is apparent that, in 1980 dollars, existing capacity is viable. Lumber producers face the real probability of short-term shutdowns (and short-term periods of very high profits). Within the range of the projected average market prices for lumber, it is apparent that efficient producers can, with their existing structure of costs, remain viable in the short-run.

Conclusions

There can be no doubt that the overvalued exchange rate for the Canadian dollar in the mid-1970's placed considerable strain on the Ontario forest products sector. The subsequent depreciation of the dollar has greatly improved the competitive position of existing facilities as well as rates of return on completely new capital investments in the three manufacturing processes studied in this report.

Wood supplies in the province of Ontario are not adequate to support increased capacity in forest products manufacture. Accordingly, favourable rates of return - particularly for new investments in newsprint and kraft pulp mills - should be taken as signals to renovate existing facilities. Renovation or replacement is especially important for out-dated newsprint mills experiencing much higher costs than facilities in the Southern United States. The analysis of the present study reveals that replacement of existing newsprint capacity with entirely new capacity offers rates-of-return well above the cost of capital for such investments. This conclusion has implications for governmental assistance programs

directed to the forest products industry.

Ontario's major cost problems are centred on wood costs at present and in the future and on transportation costs to traditional markets. Satisfactory performance of the Ontario forest products sector in the future rests crucially on relative unit cost developments in forest products manufacture here and in the United States, and on securing an exchange rate that reflects economy-wide relative Canadian and U.S. unit cost differentials in the two countries' domestic currencies.

CHAPTER 1

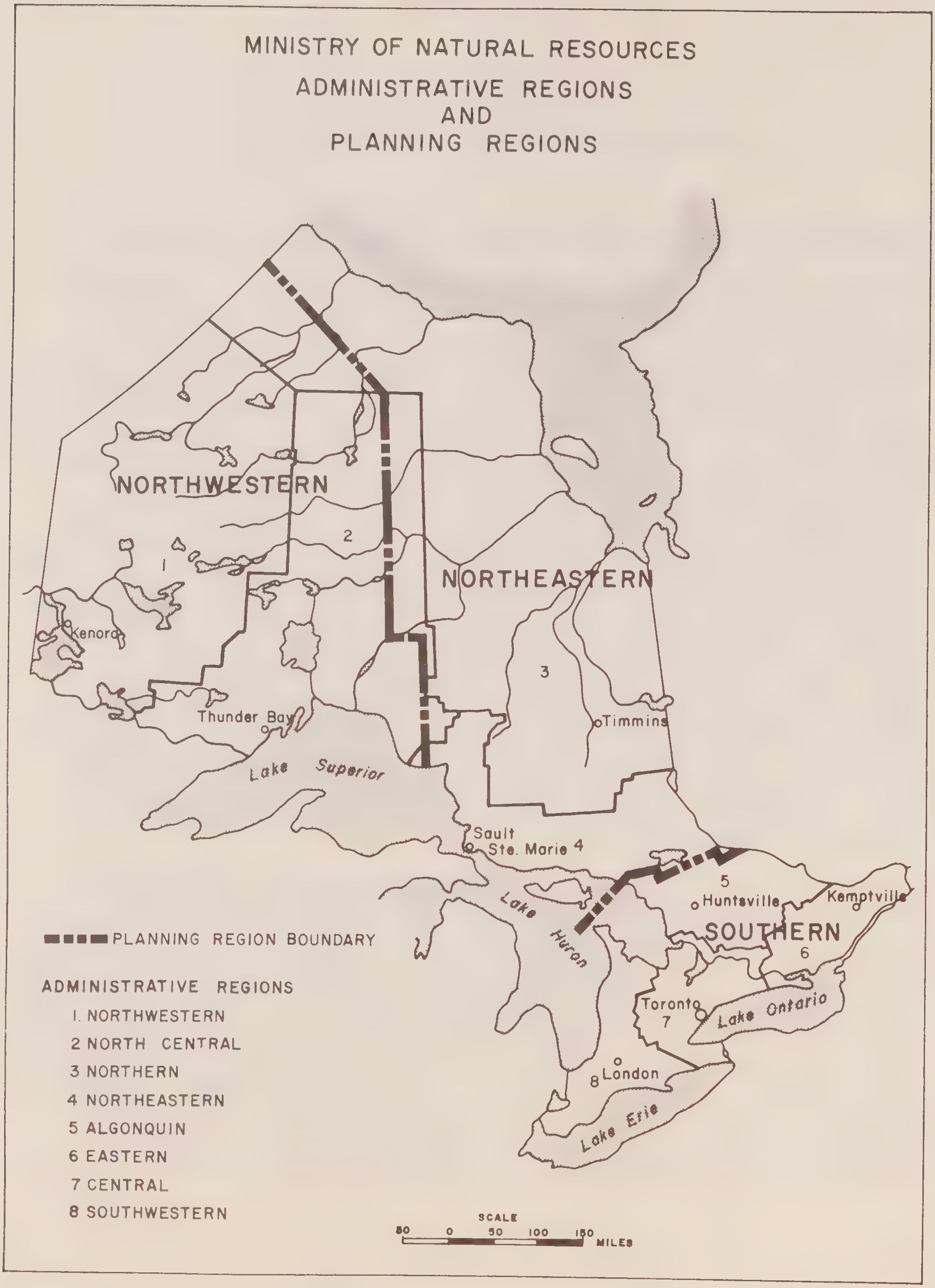
NORTH AMERICAN LOCATIONAL TRENDS

STRUCTURE OF THE NORTHERN ONTARIO FOREST PRODUCTS SECTOR

Northern Ontario can be defined approximately as that part of the province north of 46° latitude. As such, the area corresponds closely to the system of northern planning regions set out by the Ministry of Treasury, Economics, and Intergovernmental Affairs and to the four Northern Administrative regions employed by the Ministry of Natural Resources (see Chart 1.1). Fourteen towns and cities in Northern Ontario are pulp and paper locations. Sawmills and related wood-processing facilities are scattered throughout the region with particular concentrations at Hearst, Chapleau and Thunder Bay. Northern Ontario pulp and paper towns are heavily specialized in the production of newsprint paper and dried kraft pulp, most of which is sold in arms-length transactions (market pulp). As Table 1.1 reveals, Northern Ontario pulp and paper capacity amounts to nearly 12,500 short tons per day of which 80 per cent is newsprint or dried kraft pulp. There are no dried kraft pulp mills in Ontario outside the northern area and only one newsprint mill (drawing on Northern Ontario wood) is located south of 46° latitude. Most of Ontario's lumber is sawn in the northern area. Sawmills specialize in softwood lumber, principally 2x4's, with most of the hardwood lumber industry located outside Northern Ontario.

Newsprint, kraft pulp, and lumber manufacture are resource-oriented activities. Chemical pulping involves a 50 per cent or greater dry weight loss from roundwood or pulp chips so this process is clearly oriented to the forest rather than to the markets for kraft products. Lumber production involves conversion of roundwood, generally spruce and jack pine, into lumber and wood chips. The latter, with a low value to weight ratio, find local markets where the pulp mills are located so sawmilling is forest-oriented. Without chip sales, lumber production would involve an even greater loss of bulk from roundwood, again dictating a forest location. Newsprint production is also everywhere oriented to its raw materials

Chart 1.1



Source: Ministry of Natural Resources

Table 1.1

NORTHERN ONTARIO PULP AND PAPER CAPACITIES
(1980 - SHORT TONS PER DAY)

Newsprint	Iroquois Falls (Abitibi-Price)	930	
	Kapuskasing (Spruce Falls)	1080	
	Kenora (Boise Cascade)	732	
	Red Rock (Domtar)	200	
	Thunder Bay (Abitibi-Price)	340	
	Thunder Bay (Abitibi-Pt.A.)	450	
	Thunder Bay (Great Lakes)	1225	
			4957
Dried Kraft Pulp*	Dryden (Great Lakes)	430	
	Espanola (Eddy)	620	
	Fort Frances (Boise Cascade)	225	
	Marathon (American Can)	500	
	Smooth Rock Falls (Abitibi-Price)	345	
	Terrace Bay (Kimberly Clark)	1250	
	Thunder Bay (Great Lakes)	1315	
			4685
Other Papers	Dryden (Great Lakes)	200	
	Espanola (Eddy)	115	
	Fort Frances (Boise Cascade)	629	
	Iroquois Falls (Abitibi-Price)	50	
	Kapuskasing (Kimberly Clark)	83	
	Sault Ste. Marie (Abitibi-Price)	385	
	Thunder Bay (Abitibi-Price)	300	
			1762
Paperboard	North Bay (Nordfibre)	130	
	Red Rock (Domtar)	650	
	Sturgeon Falls (MacMillan-Bloedel)	275	
			1055
			12459

Source: Lockwood's Directory (1980)

*figures include pulp shipped to affiliated mills.

though for slightly more complicated reasons.[1] Since wet (or slush) pulp is over 90 per cent water, paper production can only practically be separated from pulp production if the latter is converted to dried pulp, baled, and re-pulped at the paper mill site. The costs of drying, baling, and re-pulping can be obviated if paper is manufactured at the same location as the slush pulp. Paper production is, therefore, drawn to the forest resource.

The pull of the forest on paper production varies with the type of paper involved. Canada's higher quality papers meet *tariffs* in moving to other countries, and this factor tends to produce international dried pulp shipments which move duty-free. Since newsprint is itself admitted to Canada's major markets without duty, this is a factor that preserves its resource-orientation. Market locations generally pay *lower wages* than resource-oriented locations, a factor which also works against the resource-orientation of paper production. Newsprint, however, is produced with the widest and fastest paper machines in the industry so that such wage differentials affect newsprint production costs to a lesser degree than for other grades of paper. *Transportation costs* frequently reflect value-of-service pricing formulae, and this factor additionally favours pulp over paper shipments. Here again newsprint is somewhat less influenced owing to its low value per ton among paper products. Finally, newsprint is a comparatively standard paper product consumed at fairly predictable rates by large contractual customers. The face-to-face contact advantages of a market location are correspondingly reduced.

The overall effect of drying costs, wage differentials, tariffs, value-of-service transport pricing, and market contacts is to produce different locational orientations for different types of paper and paperboard. Newsprint remains at the forest resource as described. Other products such as linerboard, corrugating medium and, to some extent, fine papers gravitate to resource or market locations. Many varieties of paperboard, building materials, and grocery/personal hygiene products are produced at markets from dried pulp.

Granted the fundamental forest orientation of lumber, kraft pulp and newsprint production, different North American forest regions possess different physical and cost characteristics

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[1]Several newsprint mills in North America now use re-cycled paper at market locations.

that influence their relative rates of development as forest products locations. The next two sections are devoted to a historical examination of the apparent competitive advantages of different forest regions for the three products of principal significance to Northern Ontario. Two basic types of information are examined:

- relative capacity and production trends in North American locations as evidence of the actual locational choices that have emerged in the forest products industry over time.

- relative production costs at different North American locations as these have been tabulated by other researchers. Our own *current* estimates of Northern Ontario's comparative cost position will be reserved for the more detailed presentation of Chapter 3.

REGIONAL PRODUCTION AND CAPACITY TRENDS

Early History of Lumber and Newsprint

Northern Ontario's lumber and newsprint industries have historical roots in the 19th and early 20th centuries while the emergence of dried kraft pulp capacity is essentially a post World War II phenomenon. The eastern North American lumber industry has been a geographically shifting sector faced with relatively unstable markets, slow consumption growth, and resource depletion. The 19th century depletion of prime timber in the U.S. Lake States and the Ottawa Valley shifted logging activities into Northern Ontario where the great white and red pine stands were cut over and floated to sawmills on the United States side of the Great Lakes.[2] Conditions of the 1890's were unfavourable to the establishment of sawmilling in Northern Ontario; taxes on logs exported to the United States had been removed in 1891. Under pressure from Ontario lumbermen and settlers, the Crown Timber Act (originally passed in 1849) was revised to prohibit the export of unmanufactured sawlogs cut on Crown lands, but sawtimber depletion had already taken its toll; peak production of lumber in Ontario was reached in 1908 with slow and steady decline thereafter.[3] By contrast, the beginning of the 20th century was a period of explosive

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[2] Eg.: Mitchell (undated), p.14.

[3] Ontario Economic Council (1970), p.8.

growth for the newsprint sector. Trends in the technology of papermaking and in mass markets for newspapers in the United States joined with trade policy shifts to generate a large migration of capacity into eastern Canada. In 1902, Ontario prohibited pulpwood exports from Crown land, requiring manufacture into chemical or mechanical pulp in Canada. The U.S. Underwood Act of 1913 allowing tariff-free admission of newsprint into the United States was a victory of American newspaper publishers over their domestic newsprint suppliers. The recession of 1920-21 dealt a permanent blow to the eastern Canadian lumber industry and newsprint producers seized the opportunity to secure large reserves of forest land to support their own investments in new capacity. The completion of the Panama Canal in 1914 exposed the eastern lumber industry to west coast competition in Europe and the eastern seaboard of North America, and the 1920's was a period in which west coast producers began to consolidate their competitive position at the expense of Ontario and Quebec sawmills.[4] Canadian newsprint production doubled from 1913 to 1919 and tripled again by 1928. The dramatic shift away from U.S. sources is evident by comparing U.S. newsprint consumption with U.S. pulpwood production in the northern states: the former tripled from 1910 to 1928 while the latter hardly increased at all.[5]

The 1921-29 period witnessed the appearance of nearly all of Northern Ontario's newsprint mills. Three mills appeared at Thunder Bay (Fort William and Port Arthur) during this period, along with mills at Kapuskasing and Kenora. The Iroquois Falls mill had been constructed in 1915, and capacity at Red Rock was not to come into existence until 1945.

Both the lumber and newsprint sectors were to be hard hit by the depression. From 1929 to 1932 lumber production in Canada fell by more than half. During the same period, newsprint production declined from 3 million short tons to 2.2 million short tons. Numerous sawmills disappeared and a number of the newly formed giants of the Canadian newsprint industry went into receivership. Prices declined sharply despite efforts by the newsprint producers and the provinces to encourage pro-rationing of demand among operators to alleviate price-cutting.

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[4] Davis *et al* (1957), pp. 17-18.

[5] U.S. Department of Commerce: *Historical Statistics of the United States*, pt. 1, Series L-180; Guthrie and Armstrong (1961), p.97.

By the end of the war, west coast capacity in lumber and newsprint was well-established. In Canada, over half of total lumber production came from British Columbia in 1950. The west coast newsprint industry was well-established before the depression. The state of Washington was the third largest newsprint-producing state in the U.S. (after Maine and New York) in 1929, and the U.S. west coast industry accounted for 30 per cent of U.S. newsprint capacity in 1950. In British Columbia, mills had been established at Ocean Falls in 1917 and Powell River in 1926. The North American newsprint market would increasingly have to be thought of in terms of two sub-markets: the region east of the Rockies and the west coast region oriented to western U.S. (California) and Asian customers.

Modern Developments in the Newsprint Sector

From the perspective of the Ontario producers of newsprint and lumber, the post-war period has been characterized by very strong competition from the U.S. southern states and from British Columbia.

The appearance of the U.S. southern newsprint industry was based on technological, locational, market, and publisher-related factors. The first newsprint mill in the U.S. South was established in 1940 at Lufkin in eastern Texas and showed that a high quality product could be produced from resinous southern softwoods in spite of initial problems of bleaching. The presence of widespread and accessible forests in the Southeast close to growing markets offered an obvious impetus to new mills once it was recognized that a substitute existed for northern softwood conifers in the pulping process. The wartime supply shortages and the rapid increase in newsprint prices after the war combined with operating ratios that remained over 100 per cent until the mid-1950's presented publishers in the southern states with shortages and induced them to seek other supplies closer to home. It gradually became clear that southern U.S. locations would be fully competitive with traditional Canadian locations. Between 1950 and 1956, two new mills joined the Lufkin installation: Bowaters' Calhoun, Tennessee mill and Kimberly-Clark's Coosa Pines mill in Alabama. Two more mills (International Paper at Mobile, Alabama and Pine Bluff, Arkansas) were constructed between 1956 and 1960 along with very large expansions of the Lufkin and Calhoun mills. The 1956-1959 period saw a surge of capacity for the industry as a whole, the first rapid increase since the Eastern Canada boom of the 1920's during which most of Northern Ontario's newsprint towns were established. Canadian capacity increased through the addition of new machines and modernization of existing

equipment. Each surge of capacity since the 1950's has led to a reduction in the Canadian share of North American total newsprint capacity: from 1950 to 1969, largely as a result of the increases of the late 1950's, the Canadian capacity share declined from 84 per cent to 76 per cent of the total. In Ontario, major increases in capacity took place at several locations (Table 1.2). New machines were installed at Kenora and Thunder Bay as part of the process. The effect was that Ontario's share of North American capacity remained the same in 1959 as it had been in 1950 - 19 per cent - despite the aforementioned shift of new mill construction to the United States South.

The late 1950's capacity surge led to lower industry operating ratios in the early 1960's, and it was not until 1965 that the Canadian operating ratio rose above 90 per cent. Newsprint contract prices, buoyant from the war to the late 1950's stabilized under the influence of excess capacity and slowly rising costs and remained at $134 per short ton at New York from 1958 to 1965. The real price of newsprint consequently declined moderately after 1962 and continued to fall into the early 1970's.

North American capacity entered into a second period of rapid expansion in 1966. Ontario did not hold its position as well during this period. From 1959 to 1969, North American capacity grew by 33 per cent, Canadian capacity grew by 31 per cent, and Ontario capacity grew by 12 per cent. The result was that Ontario's share of North American capacity fell from the 19 per cent level maintained during the 1950's to 16 per cent in 1969. It is useful to examine Canada's share of U.S. regional markets - the Northeast, Midwest, South, and West - during the late 1960's. Table 1.3 shows that the capacity surge of 1966 to 1969 reduced Canada's market share by about 4 percentage points in the U.S. Northeast, by virtually nothing in the Midwest, by 5 or 6 percentage points in the southern states, and by about 10 percentage points in the western region. Calculations from Table 1.2 show that from 1959 to 1969 in Canada newsprint capacity grew by 66 per cent in British Columbia, by 62 per cent in Ontario, by 30 per cent in Quebec, and by 31 per cent in the Atlantic provinces. Slower expansion in Ontario than in the rest of Canada and North America implies that Ontario gave up part of its market share in its least accessible markets during the period, shifting out of northeastern, southern, and western areas of the United States in the face of enlarged shipments from the southern states and the more rapidly growing Canadian sources of supply.

Table 1.2

NEWSPRINT CAPACITY BY PROVINCE - SELECTED YEARS (000 SHORT TONS PER YEAR)

British Columbia	1950	1959	1969	1979
Crofton	0	0	241 (BCFP)	281 (BCFP)
Elk Falls	0	168 (C-Z)	256 (C-Z)	265 (C-Z)
Ocean Falls	90 (Pacific)	100 (C-Z)	105 (C-Z)	96 (Ocean Falls)
Port Alberni	0	215 (M-B)	424 (M-B)	403 (M-B)
Powell River	300 (Powell)	507 (Powell)	615 (M-B)	505 (M-B)
	390	990	1641	1550
Manitoba Pine Falls	104 (Abitibi)	146 (Abitibi)	180 (Abitibi)	182 (Abitibi)
Ontario				
Fort Frances	80 (O-M)	82 (O-M)	63 (O-M)	0* [1]
Iroquois Falls	216 (Abitibi)	274 (Abitibi)	329 (Abitibi)	313 (Abitibi)
Kapuskasing	205 (Sp.Falls)	271 (Sp.Falls)	362 (Sp.Falls)	340 (Sp.Falls)
Kenora	105 (O-M)	215 (O-M)	262 (O-M)	230 (Boise)
Red Rock	70 (Brompton)	60 (St.Law.)	73 (Domtar)	72 (Domtar)
Sault Ste. Marie	97 (Abitibi)	100 (Abitibi)	71 (Abitibi)	95 (Abitibi)*[1]
Thorold	173 (Ontario)	211 (Ontario)	216 (Ontario)	239 (Ontario)
	31 (Beaver)	35 (Beaver	36 (Beaver)	0
Thunder Bay (Fort Will.)	60 (Abitibi)	166 (Abitibi)	130 (Abitibi)	129 (Abitibi)[1]
	145 (Gt.Lakes)	359 (Gt.Lakes)	437 (Gt.Lakes)	406 (Gt.Lakes)
Thunder Bay (Port Arth.)	97 (Abitibi)	135 (Abitibi)	157 (Abitibi)	155 (Abitibi)
	1279	1908	2136	1979
Quebec				
Alma (Riverbend)	200 (Price)	228 (Price)	307 (Price)	278 (Abitibi)[1]
Baie Comeau	152 (Ontario)	176 (Ontario)	352 (Ontario)	461 (Ontario)
Beaupre	111 (Abitibi)	130 (Abitibi)	165 (Abitibi)	150 (Abitibi)[1]
Bromptonville	20 (Richmond)	115 (Richmond)	142 (Kruger)	183 (Kruger)
Buckingham	108 (MacLaren)	126 (MacLaren)	133 (MacLaren)	164 (MacLaren)
Chandler	0	0	231 (Price)	220 (Abitibi)[1]

table continued overleaf...

Table 1.2 (Cont.)

NEWSPRINT CAPACITY BY PROVINCE - SELECTED YEARS (000 SHORT TONS PER YEAR)

Quebec (cont.)	1950		1959		1969		1979	
Clermont	62	(Donohue)	106	(Donohue)	166	(Donohue)	251	(Donohue)
Dolbeau	104	(L.S.J.)	128	(St.Law.)	164	(Domtar)	153	(Domtar)
Donnaconna	97	(Donna.)	120	(Donna.)	156	(Domtar)	58	(Domtar)
Gatineau	254	(CIP)	314	(CIP)	477	(CIP)	513	(CIP)
Grand'Mere	130	(C-B)	159	(C-B)	247	(C-B)	240	(C-B)
Hull	46	(Eddy)	55	(Eddy)	61	(Eddy)	0	[1]
Kenogami	230	(Price)	269	(Price)	267	(Price)	160	(Abitibi)
Port Alfred	182	(C-B)	245	(C-B)	281	(C-B)	299	(C-B)
Quebec	200	(Anglo)	277	(Anglo)	325	(Anglo)	345	(Reed)
Riviere du Loup	0		0		37	(Soucy)	165	(Soucy)
Shawinigan Falls	227	(C-B)	258	(C-B)	293	(C-B)	366	(C-B)
St. Raymond	19	(St.Ray.)	26	(St.Ray.)	21	(St.Ray.)	6	(St. Ray.)
Trois Rivieres	283	(CIP)	338	(CIP)	338	(CIP)	343	(CIP)
	191	(St.Law.)	233	(St.Law.)	194	(Domtar)	303	(Kruger)
Trois Rivieres - Cap de la Madeleine**	154	(C-B)	189	(C-B)	210	(C-B)	89	(C-B)
Windsor Mills	0		17	(Canada)	0		0	
	2770		3509		4567		4747	

Atlantic Provinces	1950		1959		1969		1979	
Cornerbrook, Nfld.	310	(Bowaters)	310	(Bowaters)	367	(Bowaters)	381	(Bowaters)
Dalhousie, N.B.	228	(CIP)	279	(CIP)	293	(CIP)	277	(CIP) [1]
Grand Falls, Nfld.	185	(Anglo)	238	(Anglo)	296	(Price)	270	(Abitibi)
Liverpool, N.S.	117	(Mersey)	146	(Bowaters)	187	(Bowaters)	176	(Bowaters)
Port Hawkesbury, N.S.	0		0		0		158	(N.Scotia)
St. John, N.B.	0		0		175	(M-B,R)	323	(M-B,R)
	840		973		1318		1585	
CANADA TOTAL	5383		7526		9842		10043	

Sources and Notes: Canadian Pulp and Paper Association *Annual Newsprint Supplements*, Lockwood's Directory, National Directory. Figures for individual mills rounded to the nearest thousand tons of annual capacity. Some mill figures for 1950 converted from daily capacity assuming 310 day operating year.

table continued...

Key to Company Names not otherwise evident: BCFP (British Columbia Forest Products), C-Z (Crown Zellerbach), M-B (MacMillan Bloedel), O-M (Ontario-Minnesota), Sp. Falls (Spruce Falls), St. Law. (St. Lawrence Corporation), Ontario (Ontario Paper Company), Beaver (Beaver Wood Fibre Company), Gt. Lakes (Great Lakes Forest Products), CIP (Canadian International Paper Company), LSJ (Lake St. John Paper Company), Donna. (Donnaconna Paper Company), C-B (Consolidated Bathurst), Anglo (Anglo-Canadian Pulp and Paper or Anglo-Newfoundland Pulp and Paper), St. Ray. (St. Raymond Paper Company), Mersey (Mersey Paper Co.), N. Scotia (Nova Scotia Forest Products), M-B,R (MacMillan Rothesay).

Footnotes to Table: [1] 1979 Abitibi figures refer to Abitibi-Price.
* converted to other groundwood papers.
**Cap de la Madeleine and Trois Rivieres mills reported together in 1950. Former does not operate in 1979.

Table 1.3

CANADIAN SHARES OF U.S. REGIONAL NEWSPRINT MARKETS
(PER CENT OF REGIONAL DEMAND)

	Northeast	Midwest	South	West
1963	79	90	40	59
1964	78	90	42	63
1965	79	91	45	67
1966	79	89	44	67
1967	78	88	42	59
1968	76	87	40	54
1969	75	88	37	55
1970	76	86	36	51
1971	81	86	31	54
1972	80	82	33	49
1973	81	83	35	52
1974	83	86	38	50
1975	79	80	32	49
1976	77	83	36	53
1977	79	83	36	53
1978	82	86	38	58

Source: Canadian Pulp and Paper Association *Newsprint Data*

Notes:
Northeast: Conn., Me., Mass., N.H., N.J., N.Y., Pa., R.I., Vt.
Midwest: Ill., Ind., Iowa, Kans., Mich., Minn., Mo., Nebr., N.Dak., Ohio, S.Dak., Wis.
South: Ala., Ark., Del., D.C., Fla., Ga., Ky., La., Md., Miss., N.C., Okla., S.C., Tenn., Tex., Va., W.Va.
West: Alsk., Ariz., Calif., Col., Haw., Idaho, Mont., Nev., N.M., Ore., Utah, Wash., Wy.

Traditional midwestern markets in which Ontario enjoys transportation advantages were apparently less susceptible to competitive pressures from other North American suppliers. Part of the slower growth of the Ontario newsprint industry in the 1960's may have reflected relative overexpansion in the previous decade: Quebec capacity grew by 27 per cent in the 1950's while Ontario added 50 per cent, a growth rate that may have been excessively optimistic. The authors of a recent study comment: "In contrast to the Quebec case, the main phase of...(Ontario's newsprint)... capacity expansion materialized much earlier between 1955 and 1960 and the total capacity of the industry virtually stabilized after that period... This earlier maturation appears related to the continental character of the Ontario industry and to the early maturing of its natural U.S. markets."[6]

From 1966 to 1969, Ontario's share of North American newsprint capacity slipped from about 18 per cent to about 16 per cent. Ontario is Canada's major supplier to U.S. midwestern markets and Table 1.3 shows that the Canadian share of this market slipped from 88 per cent in 1969 to 82 per cent in 1972, representing relative gains for producers in the southern states. Midwestern newsprint consumption grew slowly from 1973 to 1978.

More detailed data for the 1970's presented later in Chapter 2 (Table 2.2) show that Ontario was able to maintain its market share after 1972 and shifted shipments into states in the western region. The data are not easy to interpret owing to the effects of work stoppages on newsprint flow patterns but it appears that Ontario was losing market shares in its important midwest and northeast U.S. markets during the period in which the Canadian dollar was definitely overvalued in terms of Canadian relative costs (1974-76) and was able to regain market position after the depreciation of the exchange rate in 1977 and 1978. Ontario's declining share of its major markets in 1969-72 and its maintenance of a stable share of a slowly growing total after 1972 is associated with sluggish change in Ontario's newsprint capacity from 1969 to 1979 (Table 1.2). Capacity actually declined slightly in total tonnage from over 21 million short tons per year in 1969 to less than 20 million short tons in

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[6] Department of Regional Economic Expansion: *Newsprint* (1978), pp. 116-17.

1979.[7] During this period, newsprint mills at Fort Frances and Sault Ste. Marie have shifted to the production of other groundwood papers. The small Beaver Wood Fibre mill at Thorold has ceased newsprint production as well. Only Thorold's Ontario Paper Company mill has shown marked expansion from 1969 to 1979.

Canadian newsprint capacity has fallen from 74 per cent of North American capacity to 71 per cent over the last decade. Ontario capacity is now about 20 per cent of the Canadian total compared to 21.5 per cent in 1970.

The declining real price of newsprint was reversed after 1974. The capacity surge of the late 1960's had been absorbed and the Canadian operating rate rose to 95 per cent in 1974. Newsprint contract prices have nearly doubled from 1974 to 1980 while late 1970's operating rates have been consistently over 90 per cent and closer to 100 per cent since 1978.

Large capacity increases are in view for the early 1980's. As of January, 1980, an additional 2.5 million short tons of new capacity has been announced in the form of new machines in North America.[8] Since that time, new machines have been announced for the Ontario industry as well, though mostly on a replacement basis: Abitibi-Price will replace four old machines at its Iroquois Falls mill with a new modern machine, the Ontario Paper Company will replace five old machines with two new ones, and Great Lakes Forest Products is considering the installation of a new machine in Dryden.[9] Several Ontario companies have announced a range of modernization plans apart

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[7]All capacity, consumption, and production tonnage comparisons over the past decade must be interpreted in the light of the industry-wide shift in the standard weight of newsprint in 1974. The weight of a ream of newsprint (500 24" by 36" sheets) is its basis weight, and this has declined from 32 lbs. to 30 lbs. in 1974. The effect is that the same output of paper in terms of printing area now weighs about 6 per cent less than it did in the early 1970's. With this change in mind, Ontario's capacity in terms of printing area has been approximately constant over the past ten years.

[8]*Pulp and Paper*, Vol. 54, No. 2, February 1980, 176.

[9]*The Chronicle Journal* (Thunder Bay), Feb. 27, 1980.
The Globe and Mail, Mar. 6, 1980.
The Globe and Mail, Apr. 18, 1980; *The Chronicle Journal*, (same date).

from installation of new machines. It is apparent, however, that most capacity increases will emanate from other regions: of the 2.5 million short tons announced by the end of 1979, 20 per cent will be built in the southern states, 42 per cent on the west coast (including major expansions at Port Alberni, Campbell River-Elk Falls, and Powell River), 10 per cent in Quebec, and the balance in other regions.

Modern Developments in the Kraft Pulp Sector

In lumber and kraft pulp production, British Columbia has been a dominant force in the post-war period with the U.S. South making great strides in kraft pulp production as well.

Dried kraft pulp is nearly as important to the Northern Ontario economy in terms of total tonnage as newsprint. Unlike newsprint, however, dried kraft pulp is essentially a post-war phenomenon: of seven mills now producing in Northern Ontario (Table 1.1), four appeared since 1949 (at Fort Frances, the conversion of Smooth Rock Falls, Terrace Bay, and Thunder Bay). While newsprint capacity increased by 55 per cent in Ontario from 1950 to 1979, kraft pulp capacity increased by a factor of seven. The *National Directory* for 1938 listed only the Dryden Paper Company among six Canadian suppliers with kraft pulp for sale in the pre-war period. While Canadian exports of newsprint increased by 77 per cent since 1950, draft pulp exports in the bleached and semi-bleached categories rose by a factor of forty.

Like newsprint, bleached kraft pulp - the category in which Ontario mills are specialized - is highly export oriented: 84 per cent of Canadian production went to export markets in 1978. As with newsprint, Ontario's major markets are in the midwestern and northeastern parts of the United States. Canada's orientation to European markets is stronger in the case of sulphate pulp than it is for newsprint. In 1978, 80 per cent of our newsprint exports went to the United States while the corresponding figure for kraft pulp was 50 per cent. Kraft pulp exports to Western Europe and Asia, negligible after the war, now account for nearly half of Canadian exports, giving substantial impetus to Canada's east and west coast producing regions. Since 1950, fourteen of British Columbia's seventeen market kraft mills appeared and capacity in the Atlantic region also increased considerably (Table 1.4).

Canada has not only been able to participate in increased off-shore markets since the war but has also benefited from rapidly growing North American markets from which Scandinavian suppliers have partially withdrawn (they have withdrawn entirely from the North American newsprint market). Describing the basis for postwar expansion, Davis *et al* pointed out that:

Table 1.4

KRAFT PULP CAPACITY BY PROVINCE - SELECTED YEARS
(SHORT TONS PER DAY)

British Columbia	1950	1965	1970	1975	1980	1980(dried)*
Campbell River (C-Z)	0	1025	1200	1200	1100	590
Castlegar (Can Cell)	0	600	600	600	600	600
Crofton (BCFP)	0	950	875	1000	1200	1000
Gold River (Tahsis)	0	0	750	750	750	750
Kamloops (Weyer.)	0	250	250	1250	1250	1250
Kitimat (Eurocan)	0	0	915	915	915	0
MacKenzie (BCFP)	0	0	0	550	600	600
Nanaimo (M-B)	225	1250	1350	1250	1250	1250
Ocean Falls (Ocean)	150	185	0	0	0	0
Port Alberni (M-B)	165	900	920	1065	795	285
Port Mellon (CFP)	140	525	525	550	550	550
Powell River (M-B)	0**	0**	515	550	500	150
Prince George (Intercon)	0	0	650	700	700	700
Prince George (Northwood)	0	625	625	800	800	800
Prince George (P.George)	0	710	710	750	780	450
Prince Rupert (Can Cell)	0**	0	800	800	1200	1200
Quesnel (Cariboo)	0	0	0	750	750	750
Skookumchuck (Crestbrook)	0	0	400	400	460	460
Woodfibre (Rayonier)	0**	0	500	600	600	600
	680	7020	11585	14480	14800	11985

Prairies						
Grande Prairie (P and G)	0	0	0	750	750	750
Hinton (St. Regis)	0	510	525	545	545	545
The Pas (ManFor)	0	0	0	450	400	0
Prince Albert (P. Albert)	0	0	650	850	850	850
	0	510	1175	2595	2545	2145

Ontario						
Cornwall (Domtar)	0**	345	345	400	450	0
Dryden (Great Lakes)	80	350	380	630	630	430
Espanola (Eddy)	225	315	650	720	720	620
Fort Frances (Boise)	0	0	0	500	520	225
Marathon (Amer. Can)	320	430	450	500	500	500
Red Rock (Domtar)	250	420	470	790	770	0
Smooth Rock Falls (Abitibi-Price)	0**	95	315	345	345	345
Terrace Bay (Kimberly)	0***	375	410	425	1250	1250
Thunder Bay (Great Lakes)	0	0***	600	600	1315	1315
	875	2330	3620	4910	6500	4685

Table 1.4 (Cont.)

Quebec	1950	1965	1970	1975	1980	1980(dried)*
East Angus (Domtar)	180	200	208	220	150	0
Jonquiere (Abitibi-Price)	0**	215	265	350	375	60
La Tuque (CIP)	450	450	550	1200	1400	460
Lebel sur Quev. (Domtar)	0	0	750	750	750	750
New Richmond (C-B)	0	600	640	650	650	0
Portage du Fort (C-B)	0	0	525	580	580	580
St. Felicien (Donohue)	0	0	0	0	760	760
Thurso (Thurso Pulp)	0	350	325	325	330	330
Trois Rivieres (C-B)	255	300	285	290	290	0
Windsor (Domtar)	200	400	400	485	485	225
	1085	2515	3948	4850	5770	3165

Atlantic Provinces						
Bathurst, N.B. (C-B)	230	260	300	220	160	160
Nackawic, N.B. (Ste Anne)	0	0	800	800	690	690
Newcastle, N.B. (Boise)	140	500	500	700	550	550
New Glasgow, N.S. (Scott)	0	500	500	600	600	600
St. John, N.B. (Irving)	0	250	275	600	800	800
Stephenville, Nfld. (Abitibi-Price)	0	0	0***	1000	0***	0
	370	1510	2375	3920	2800	2800
CANADA TOTAL	3010	13885	22703	30755	32415	24780

Source: Lockwoods Directory

Key to Company Names not otherwise evident: C-Z (Crown Zellerbach), Can Cell (Canadian Cellulose), BCFP (British Columbia Forest Products), Weyer (Weyerhaeuser), M-B (MacMillan-Bloedel), CFP (Canadian Forest Products), Ocean (Ocean Falls Corporation), Intercon (Intercontinental Pulp Co.), P. George (Prince George Pulp), P and G (Procter and Gamble), ManFor (Manitoba Forest Products), P.Albert (Prince Albert Pulp), Amer. Can (American Can of Canada), CIP (Canadian International Paper), C-B (Consolidated Bathurst), SteAnne (Ste. Anne - Nackawic Pulp and Paper).

Notes: *Directory definition of market pulp. Includes non-arms-length transactions for North America which are excluded in the Canadian Pulp and Paper Association definition of market pulp. See Appendix 1-A.

**producing sulfite and, in some cases, groundwood pulp.

***pulpmill under construction.

> "... major changes occurred in the war years. Loss of imports from the Scandinavian countries, which in the immediate prewar period had provided about two-thirds of United States market needs, created major supply problems and, to meet minimum essential needs of the United States wartime economy, exports from Canada were increased greatly."[10]

After the war, "United States converters of pulp looked more and more to their own sources and to Canada as a reliable source of supply."[11] United States imports of wood pulp from sources other than Canada declined to 4 per cent in the early 1950's and fell further to 0.3 per cent by 1979. As United States pulp capacity expanded in the early 1950's, Canada lost some of its wartime prominence. The Canadian share of U.S. wood pulp consumption declined from 10 per cent of the total to 7.3 per cent in 1960, a share that has been retained over the past two decades. The United States southern pine region has played a major role in the kraft pulp sector as might have been expected from its role, described in the last section, in the production of newsprint. At present, about 70 per cent of United States dried kraft pulp capacity is located in the southern states and the latter's capacity is approximately equal to British Columbia's and more than double that of Ontario.

Printing and writing paper other than newsprint and tissue grades account for most of United States consumption of bleached kraft market pulp.[12] Table 1.5 shows the pattern of consumption growth in the United States for total paper and paperboard, newsprint, and the printing-writing-tissue paper combination. Newsprint consumption has grown least rapidly and printing-writing and tissue consumption most rapidly over the 1950 to 1977 period. These patterns of demand increase in our major market are reflected in the relative growth rates of newsprint and kraft pulp capacities already mentioned: over the 1950 to 1977 period, Canadian newsprint exports grew by 63 per cent while kraft pulp exports to the United States market increased by 418 per cent.[13]

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[10]Davis, Best *et al* (1957), 135.

[11]Ibid.

[12]Hutchison (1972).

[13]Canadian Pulp and Paper Association: *Reference Tables 1979*, Table 19.

Additional factors were at work to increase kraft pulp production in Canada. Penetration of Western European and Asian markets has increased strikingly over the postwar period in the kraft pulp sector of the industry. To continue the comparison with newsprint: in 1950, 96 per cent of Canada's kraft pulp exports went to the United States, compared with 52 per cent in 1977; while 95 per cent of newsprint exports went to the U.S. in 1950, compared with 78 per cent in 1977. Our share of the U.S. newsprint market, relative to U.S. suppliers has been declining over the postwar period while our share of the U.S. wood pulp market has been relatively stable.

Table 1.5

UNITED STATES PAPER AND PAPERBOARD CONSUMPTION 1950-77 (000 SHORT TONS)

	Total Paper & Board	Newsprint	P&W and Tissue*
1950	29100	5900	5800
1955	35000	6600	7400
1960	39300	7400	9100
1965	49100	8550	12100
1970	57900	9700	15000
1975	56000	9200	14700
1977	66300	10200	18300
Per Cent Change	128	72	215

Sources: Canadian Pulp and Paper Association *Reference Tables 1979* (newsprint), *Statistical Abstract of the United States* (1978), *Historical Statistics of the United States*, part 1 (1974)

* Printing and Writing Paper (P&W) defined as total paper consumption minus newsprint, packaging and industrial grades, and tissue paper.

The most striking development illustrated in Table 1.4 is the tremendous expansion of capacity in British Columbia from the relatively small coastal base in 1950. As in many areas of North America, pulp and paper production on the west coast followed after the establishment of lumbering. In some areas, the original sawmilling sector declined as sawtimber was depleted. In other areas the sawmilling sector

developed later and remained much smaller than the pulp and paper sector while on the west coast, the relative prominence of the sawmilling sector allows pulpmills to rely heavily on lumber producers for pulp chips. This traditional reliance on sawmill residues has allowed British Columbia to enjoy low wood costs in the manufacture of pulp.

British Columbia's kraft pulp sector began at tidewater locations but has subsequently moved to locations in the provincial interior as well (Table 1.4).[14] In the early 1970's, 30 per cent of British Columbia's shipments of wood pulp moved to United States markets of which 21 per cent moved by rail to midwestern markets, and 32 per cent went by rail or water to the states of the Atlantic and Gulf coasts.[15] In sharp contrast to newsprint for which separate eastern and western North American markets characterize the structure of product flows, British Columbia pulp moves into the centre and eastern part of the North American continent in direct competition with supplies from Eastern Canada and the United States South. Ontario producers are, therefore, faced with direct west coast competition in markets closest to Ontario: in 1978 the U.S. midwestern states received about the same volume of wood pulp shipments from British Columbia as from Ontario.[16]

Modern Developments in the Lumber Sector

Over 1,000 separate establishments manufacturing softwood and hardwood lumber in Canada report to Statistics Canada. Approximately 20 per cent of these lumber establishments are located in Ontario. Of the more than 200 establishments involved about 70 report in detail to *Statistics Canada* and about 65 are listed in *Madison's*

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[14] In 1950, all British Columbia kraft pulp locations were tidewater locations but interior mills appeared in the 1950's and 1960's as wood chip prices rose on the coast and British Columbia encouraged a closer utilization policy for interior forests previously logged almost entirely for sawmill products. See Guthrie and Armstrong (1961) and Barr and Fairbairn (1974).

[15] Pearse (1976), Volume 2, Appendix B, 5-6.

[16] Canadian Pulp and Paper Association: *Canadian Pulp and Paper Products-Exports and Imports* 1977-78. (derived from Statistics Canada: *Exports* (65-202), Table 7) See also the discussion in Chapter Two.

Directory.[17] Average production per sawmill is a misleading figure since the industry tends to be divided into firms of substantial capacity (20 million board feet annually or greater) producing for markets in the major urban centres of eastern North America (generally those firms listed in *Madison's*) and a large number of smaller operations producing specialty products or standard products for local markets. Over the past fifteen years, sawmills in the smaller size categories have come to occupy a smaller share of total production, while larger scale operations have expanded their relative shares.[18] Granted this trend, sawmilling still differs sharply from pulp and paper production in that small-scale units can survive in competition with much larger operations. This is due to a number of factors. Economies of scale are not as important in lumber production as in pulp and paper, and transportation costs are rather more onerous. Sawtimber is more concentrated and locationally specific than pulpwood supplies so that smaller mills can survive by being strategically located with respect to their (limited) wood supplies.

Northern Ontario lumber producers meet strong competition from British Columbia and from the United States South. From the end of the war to the late 1960's, Ontario lumber production fluctuated around a nearly static trend but has since increased considerably from its earlier 700-800 thousand Mfbm range to the present range of 1400-1600 thousand Mfbm (Table 1.6 and Chart 1.2). To a substantial extent, the recent expansion reflects the development and dissemination of small-log processing systems. Tree-length logging and changes in sawmill technology have greatly reduced the minimum size definition for sawtimber that can be economically converted into lumber, leading to large expansions of capacity and production in the interior of British Columbia and in eastern Canada. In addition, there has been increasing stress on integration of lumber and pulp production with lumber manufacturers supplying larger volumes of pulp chips to the pulp and paper sector. Outlets for pulp chips are particularly important to the economics of small-log harvesting and processing operations.

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[17]Statistics Canada: *Sawmills & Planing Mills* (35-204); *Madison's Canadian Lumber Directory* (1979-80).

[18]Department of Industry, Trade and Commerce: *Review of the Canadian Forest Products Industry* (1978), Table 7.

Table 1.6

CANADA
LUMBER PRODUCTION BY PROVINCE
(MILLIONS OF FEET BOARD MEASURE)

Year	New-found-land	Prince Edward Island	Nova Scotia	New Bruns-wick	Quebec	Ontario	Mani-toba	Saskat-chewan	Alberta	British Columbia	Yukon and NW Terri-tories	Total Canada
1950	45	12	281	299	1,130	820	58	66	331	3,509	3	6,554
1951	42	10	332	292	1,183	821	60	79	398	3,724	8	6,949
1952	55	9	297	260	1,094	841	61	79	410	3,696	6	6,808
1953	49	10	296	335	1,201	824	55	82	401	4,046	7	7,306
1954	31	9	273	227	1,099	722	45	86	366	4,379	7	7,244
1955	33	9	354	275	1,025	760	47	75	422	4,914	6	7,920
1956	31	7	286	281	1,178	777	31	49	357	4,735	8	7,740
1957	39	8	256	250	1,064	672	37	56	300	4,412	6	7,100
1958	29	7	199	236	911	583	40	64	255	4,850	5	7,179
1959	38	8	220	308	1,038	621	37	54	314	4,949	4	7,591
1960	29	8	232	278	1,116	629	34	67	308	5,305	6	8,012
1061	35	8	245	274	1,003	641	36	80	288	5,620	7	8,237
1962	29	9	228	296	1,172	654	35	72	323	6,004	7	8,829
1963	36	7	242	289	1,296	749	44	66	406	6,734	8	9,877
1964	30	6	232	355	1,415	791	42	61	319	7,095	10	10,356
1965	26	7	238	328	1,449	834	38	88	351	7,449	7	10,815
1966	26	7	223	305	1,379	910	45	79	300	7,319	6	10,599
1967	29	5	193	271	1,465	823	38	89	301	7,110	5	10,329
1968	24	4	201	272	1,163	893	46	93	337	7,811	7	11,351
1969	27	10	222	325	1,756	895	57	118	426	7,696	6	11,538
1970	35	12	197	280	1,604	849	52	105	466	7,657	7	11,263
1971	32	13	158	287	1,717	894	70	121	500	8,937	5	12,735
1972	32	12	185	312	2,108	966	100	169	591	9,506	4	13,984
1973	50	14.4	200	298	2,357	1,132	120	167	806	10,424	3	15,571
1974	41	12	176	311	2,207	1,252	110	139	630	8,741	3	13,622
1975	41	12	144	256	2,292	948	103	127	425	7,469	3	11,820
1976	47	13	158	321	2,365	1,175	113	156	525	10,670	3	15,546
1977	48	12	184	321	2,752	1,352	99	218	626	12,026	6	17,643

Source: Statistics Canada 35-204. (Figures may not add due to rounding)

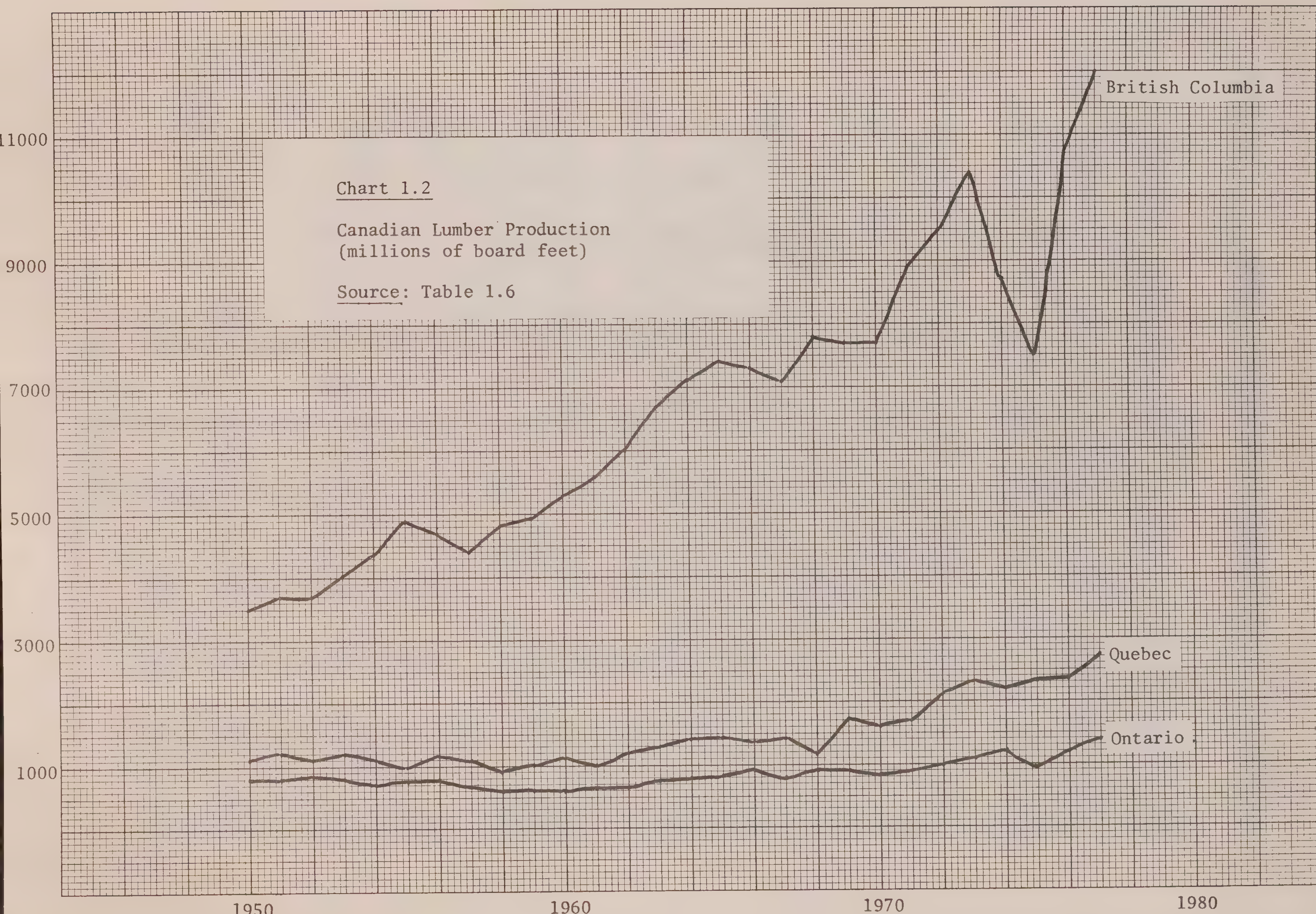

Chart 1.2

Canadian Lumber Production
(millions of board feet)

Source: Table 1.6

The growth of small-log systems has involved a change in the grade composition of Canadian lumber production. As the Department of Industry, Trade and Commerce notes, "...{t}his is largely the result of the declining availability of and increased competition for logs of sufficient size and quality to manufacture the higher grades and increased production in the B.C. Interior and Central Canada where, because of the nature of the resource, production is confined for the most part to construction grades of lumber."[19]

Notwithstanding the recent growth of lumbering in Central Canada, the postwar growth of lumber production in Canada has been dominated by the expansion of British Columbia. As the accompanying figures illustrate, B.C.'s lumber output has more than tripled in the period from 1950 to 1977. Over three-quarters of Canadian lumber exports to the U.S. originate in British Columbia and over 90 per cent of Canada's overseas lumber exports - principally to the European Economic Community and Japan - also originate in B.C. Table 1.7 shows a detailed breakdown of British Columbia's lumber shipments. Exports to the United States from the British Columbia coastal region tend to proceed by water to U.S. Atlantic ports, while exports from the interior of the province are generally shipped by rail to destinations in the Midwest or Northeast.[20] Both flow patterns bring west coast lumber into competition with eastern Canadian supplies and shipments from the U.S. southern states.

Western U.S. lumber production (from the states of Washington, Oregon, and California) has been quite static since the 1950's owing to deminishing supplies of sawtimber. During the 1950's, softwood lumber production from the U.S. South declined gradually, but this trend has been reversed since the early 1960's and the South now accounts for about 25 per cent of U.S. production. Southern sawtimber stocks have increased over the past few decades with improved forest management and rapid growth. The new small-log technology is also favourable to lumber production in this region. The author of a recent article on B.C. markets notes that southern pine lumber sales in the northeast U.S. have reduced British Columbia's sales in that region.[21] The authors of the

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[19]Ibid, p.31.

[20]Competition from the B.C. Interior is most relevant to Ontario producers. Further discussion surrounds Chart 2.6 in the next chapter.

[21]Manning (1977), 79.

Table 1.7

BRITISH COLUMBIA LUMBER SHIPMENTS 1972-1978
(million board feet)

Destination			1972	1973	1974	1975	1976	1977	1978*
CANADA, B.C. (incl. LCL)		Road	1,019.0	1,117.3	1,148.0	1,056.5	1,399.5	1,532.0	—
		Rail	72.4	68.1	86.3	57.3	121.5	114.8	—
		Water	17.5	14.4	24.7	22.1	33.5	44.1	—
		Total	1,108.9	1,199.8	1,259.0	1,135.9	1,554.5	1,690.9	1,787.9
	PRAIRIES 1)	Road	78.3	95.2	120.7	112.0	168.9	169.3	—
		Rail	285.8	289.7	409.1	457.4	490.7	382.0	—
		Water	.5	—	—	—	—	—	—
		Total	364.7	384.9	529.8	569.5	659.6	551.3	—
	EAST	Road	3.9	10.4	7.6	7.9	7.3	13.2	—
		Rail	379.2	415.5	462.5	476.9	481.7	377.4	—
		Total	383.1	425.9	470.1	484.8	489.0	390.6	—
	TOTAL	Road	1,101.2	1,222.9	1,276.3	1,176.4	1,575.7	1,714.5	—
		Rail	737.4	773.3	958.0	991.7	1,093.8	874.2	—
		Water	18.0	14.4	24.7	22.1	33.5	44.1	—
		Total	1,856.6	2,010.6	2,259.0	2,190.2	2,703.1	2,632.8	2,719.5
U.S.A.	NORTH EAST	Road	.9	3.7	2.4	3.3	8.1	2.5	5.5
		Rail	628.0	742.4	672.2	619.6	732.0	575.9	580.4
		Water	1,048.5	948.3	573.1	403.8	621.8	771.7	683.4
		Total	1,677.4	1,694.4	1,247.7	1,026.7	1,361.9	1350.1	1,269.3
	NORTH CENTRAL	Road	2.6	8.5	9.5	9.3	15.3	15.5	28.4
		Rail	2,265.1	2,035.2	1,652.0	1,425.7	2,093.6	3,148.0	2,531.3
		Total	2,267.7	2,043.7	1,661.5	1,435.0	2,108.9	3,163.5	2,559.6
	SOUTH ATLANTIC	Road	.4	3.3	1.7	1.9	3.3	2.8	7.1
		Rail	970.0	1,060.3	804.1	723.4	901.3	962.3	1,297.1
		Water	604.9	494.8	277.4	195.3	261.7	364.0	415.7
		Total	1,575.2	1,558.3	1,083.2	920.6	1,166.3	1,329.1	1,719.8
	SOUTH	Road	1.0	1.8	1.7	2.2	2.8	3.5	9.7
		Rail	853.3	785.4	632.0	537.1	813.6	897.0	1,284.1
		Water	50.7	42.2	19.6	3.6	—	29.8	48.8
		Total	905.0	829.3	653.3	542.9	816.4	930.3	1,342.7
	WEST 2)	Road	132.5	201.9	175.5	145.1	257.7	449.1	568.7
		Rail	299.5	317.9	268.5	230.2	416.4	546.2	717.6
		Water	122.5	114.0	93.1	38.1	116.7	223.9	258.5
		Total	554.5	633.8	537.1	413.4	790.8	1,219.2	1,544.7
	TOTAL 3)	Road	137.4	219.2	190.9	161.7	287.2	473.4	619.3
		Rail	5,015.8	4,941.1	4,028.9	3,536.0	4,956.8	6,129.4	6,410.5
		Water	1,826.5	1,599.2	963.1	640.9	1,000.2	1,389.4	1,406.4
		Total	6,979.7	6,759.5	5,182.9	4,338.6	6,244.2	7,992.2	8,436.2
E.E.C.	BELGIUM, LUX.		34.7	46.1	44.7	27.6	91.7	56.7	64.0
	DENMARK		—	—	—	—	—	.9	1.5
	FRANCE		19.1	31.8	69.8	29.9	78.6	94.3	96.1
	GERMANY, WEST		40.7	43.3	28.9	28.0	50.5	52.1	71.4
	IRELAND		3.9	—	4.5	.1	18.8	11.2	2.7
	ITALY		14.4	14.7	18.0	8.8	17.5	17.5	39.3
	NETHERLANDS		17.8	22.7	18.6	7.6	14.3	22.2	32.4
	UNITED KINGDOM		348.4	491.2	560.1	233.3	536.6	507.7	407.6
		Total	479.0	649.9	744.7	335.4	808.2	762.6	714.9
OTHER EUROPE			3.5	3.8	13.1	5.3	7.4	6.7	2.9
MIDDLE EAST			1.0	1.9	60.0	23.7	17.0	21.0	10.9
OTHER AFRICA			49.0	35.2	59.8	37.8	28.7	67.8	79.6
OTHER ASIA (except Japan)			.1	—	.2	—	—	.1	.3
JAPAN			396.1	617.2	501.3	407.6	633.8	705.7	784.8
AUSTRALIA			136.6	178.9	151.8	61.5	137.1	116.7	133.6
OTHER OCEANIA			3.0	6.0	3.5	.5	.8	1.1	1.5
SOUTH AND CENTRAL AMERICA			1.8	.8	1.1	1.9	.7	8.9	7.8
PUERTO RICO			78.7	71.3	62.4	50.2	57.9	53.5	68.1
OTHER CARIBBEAN			3.0	2.9	53.2	50.9	9.5	17.5	2.4
		Total	672.8	918.0	906.3	639.5	893.1	999.0	1,091.9
TOTAL ALL SHIPMENTS			9,988.1	10,338.0	9,092.9	7,503.7	10,648.6	12,386.6	12,962.5

Source: Statistics Canada and COFI (Individual columns may not add due to rounding).

*) 1978 breakdown of domestic shipments is not available (except B.C. ~~total~~) due to secrecy requirements of the Statistics Act.

1) Including Yukon and N.W.T.

2) Including Hawaii and Alaska

3) Excluding Puerto Rico

Department of Industry, Trade and Commerce study already cited point out that "...Canadian producers have experienced some competitive pressures from the U.S. South in traditional eastern markets, particularly during the recent downturn... (1973-74).... The favourable timber supply situation in the U.S. South suggests potential for further growth in Southern pine lumber production but this increase will be offset by a decline in production anticipated in the U.S. Pacific Northwest."[22]

Despite historical stability in total United States lumber consumption, the experience of the 1970's and forecasts undertaken by the U.S. Forest Service for the 1980's and beyond suggest that lumber consumption will be much stronger than in the past.[23] Since the United States is Canada's most important market for lumber and virtually all U.S. lumber imports originate in Canada, these forecasts promise a substantial growth in demand for Canadian products in the 1980's and 1990's. Whether or not Ontario producers will participate importantly in future production increases depends upon our relative cost position, availability of saw-timber in Northern Ontario, and the regional breakdown of United States consumption increases. These factors will be discussed in detail in subsequent chapters.

COMPARATIVE REGIONAL COSTS

The discussion of the preceding section has brought out the following regional patterns:

- Canadian *newsprint* capacity has declined relative to United States capacity since the appearance of the U.S. South producers in the 1950's. Faced with slow growing continental markets for its exports and southern competition, Ontario's capacity has been virtually static since the early 1960's. Other Canadian regions grew during the 1960's but growth has since levelled off (Table 1.2).

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[22] Department of Industry, Trade, and Commerce (1978), p.35.

[23] USDA Forest Service (1977). These forecasts are currently being revised.

- Canadian *kraft pulp* capacity has grown very rapidly in competition with rapid expansion in the United States South. Most of Canada's growth has been in British Columbia, but other provinces, including Ontario, have participated to a lesser degree. Part of central Canadian growth reflects the very rapid increase in consumption of kraft paper products compared to newsprint (Table 1.5) even though Ontario and Quebec have been exposed to direct competition in dried kraft pulp sales from B.C. producers.

- Canada has been the fastest growing area in North America in *lumber* production but, again, virtually all the growth has taken place on the west coast. As Chart 1.2 illustrates, until the late 1960's, central Canadian production was quite static. Since that time, production in Ontario and Quebec has nearly doubled in the face of buoyant consumption. As with kraft pulp, Ontario competes directly in markets served by the two most expansive North American production areas: B.C. and the U.S. South.

The foregoing patterns suggest a probable structure of relative regional production costs with the U.S. South and British Columbia occupying low cost positions and other North American regions experiencing higher production costs in varying degrees. Several studies, going back as far as the pre-war period, contain regional cost estimates for newsprint, kraft pulp, and lumber.

Dealing first with *newsprint*, the earliest estimates appear to be those tabulated by Guthrie in 1928, a point immediately following the enormous expansion of capacity in eastern Canada.[24] Subsequent estimates were made by Haviland, Takacsy and Cape for 1964, R.A. Daly and Company for 1965 and 1968, Islam for 1969, and Sandwell Management Consultants for 1976.[25] Table 1.8 summarizes the results of these studies. The average cost figures *exclude* capital costs and transportation and *include* wood costs, mill labour costs,

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[24]Guthrie (1941), Chapter 13.

[25]Haviland, Takacsy, and Cape (1968); R.A. Daly (1969); Islam (1973); Sandwell Management Consultants (1977).

power and fuel costs, and miscellaneous materials (including chemicals) plus some elements of overhead cost depending upon the study. With the exception of the Guthrie figures, quoted in U.S. dollars for all regions, the data are in Canadian funds. The Guthrie, Islam, and Sandwell figures refer to the average variable costs of operating *existing* capacities in the regions tabulated while the Daly and Haviland-Takacsy-Cape data examine what average variable costs would have been with new capacity placed in each region. Taken as a whole, the data support the view that the U.S. South and the North American west coast regions have experienced lower production costs than the eastern Canadian provinces. The cost advantage would be even larger if transportation costs were added to reflect movements of newsprint into 'traditional markets'; this is particularly so in comparisons between the U.S. South and Ontario.

Table 1.8

AVERAGE (VARIABLE) COST OF NEWSPRINT PRODUCTION IN SELECTED NORTH AMERICAN LOCATIONS ($/SHORT TON)

Author	Year	Region					
		Eastern Canada					
		Ontario	Quebec	B.C.	US South	US NW	US NE
Guthrie	1928	45.65	43.07	-	-	38.81	46.55
Haviland *et al*	1964		73.40	66.78	71.09	67.72	-
Daly	1965	78.00		72.00	71.00	-	-
Daly	1968	86.00		79.00	82.00	-	-
Islam	1969	98.97	102.14	89.39	-	-	-
Sandwell	1976	193.00		194.00	184.00	175.00	-

Sources: See footnotes 24 & 25.

Notes: The Guthrie figures are in $ U.S. The U.S. Northeast figure is an average of Maine, New York and the Lake States. The Haviland-Takacsy-Cape figures are averages excluding depreciation. The Islam figures include $8-$10 in 'mill burden' (insurance, etc.) The Sandwell figures are averages from a fairly wide range from which average transportation and depreciation have been subtracted.

Turning to costs of production for *kraft pulp*, a number of comparisons dating back to the pre-war period have been made. Guthrie and Armstrong provided comparisons of production costs in selected United States locations for the years 1935 and 1945.[26] More recent estimates appear in the Daly and Sandwell Studies previously cited. These results are reported in Table 1.9.

Table 1.9

AVERAGE (VARIABLE) COST OF KRAFT PULP PRODUCTION
IN SELECTED NORTH AMERICAN LOCATIONS ($/SHORT TON)

Author	Year	Region						
		Ontario	Eastern Canada	B.C. Coast	B.C. Interior	US South	US NW	US NE
Guthrie	1935					23.63	22.02	34.02
Guthrie	1945					35.91	39.71	59.50
Daly	1965		104.00	86.00		89.00		
Daly	1968		118.00	96.00		107.00		
Sandwell	1976	285.00		205.50	191.00	184.00	197.00	

Sources: Guthrie & Armstrong (1961), Daly (1969); Sandwell (1977)

Notes: Guthrie & Armstrong figures are in $U.S. U.S. Northeast refers to the Lake states. The Daly figures are for new capacity, other figures refer to established producers. Sandwell's figures are averages (excluding transportation and depreciation) from a fairly wide cost range.

Kraft pulp production has been substantially less costly on the west coast and in the U.S. South than in eastern Canada. Ontario's cost disadvantage shows up particularly sharply in the Sandwell figures.

Regional relative cost estimates for softwood lumber are not as common as for pulp and paper products. Results reported in recent studies are included in Table 1.10.

[26] Guthrie and Armstrong (1961).

Table 1.10

AVERAGE COST OF SOFTWOOD LUMBER PRODUCTION IN VARIOUS NORTH AMERICAN LOCATIONS ($/Mfbm)

Author	Date	Region					
		Ontario	Quebec	B.C. Coast	B.C. Interior	U.S. South	U.S. N.W.
Holley	1965			0	.95	.13	0-.52
Sandwell	1976	142.50	128.50	184.00	118.50	116.50	152.00
Peat-Marwick	1976	138.57					
Haynes-Adams	1979			110.00		110.00	107.00-135.00

Sources: Holley (1970); Sandwell Management Consultants (1977); Peat Marwick and Partners (*Wood Chip Report*) (1979); Haynes & Adams (1979).

Notes: The Holley figures are relative to B.C. Coast costs per Mfbm. Sandwell figures exclude transport and depreciation and are averages over a range. The Haynes-Adams figures are in 1967 dollars. Holley & Haynes-Adams data in $U.S.

The above information, sketchy as it is, suggests that the U.S. South and the interior areas of the west coast experience somewhat lower production costs than central Canada.

The overall impression from Tables 1.8 to 1.10 confirms the expectation, based on relative regional capacity and production developments, that the west coast area (particularly B.C. where wood supplies have been adequate to support new industry) together with the U.S. southern states have been preferred locations from the standpoint of production cost. These locations have also had the advantage of proximity to the more rapid growth areas in North America and access to European and Asian markets. Ontario, by contrast, serves slower growing North American markets and has not participated in offshore sales. The next chapter examines the structure of Ontario's export flows in greater detail.

APPENDIX 1-A

MARKET *versus* DRIED PULP

The dried pulp capacities shown in Table 1.4 must be interpreted with caution. In each case, they refer to the mill's *net production* of kraft pulp over and above its own requirements (if any). *Lockwood's Directory* refers to this as *market* pulp. The Canadian Pulp and Paper Association adopts a narrower definition of *market* pulp which excludes from net production all shipments to papermills owned, controlled or affiliated with the producing pulpmill provided such receiving papermills are located in North America. All pulp exported to non-North American destinations is included in the CPPA's definition of market pulp.[1] Thus, the last column of Table 1.4 refers to net production rather than the CPPA market pulp concept. *Total* Canadian capacity of kraft pulp in 1980 (slush plus dried) is 32,415 short tons per day according to the entries in *Lockwood's Directory*. Taking 350 days per year as the present definition of full-capacity operation in the pulp and paper industry, 1980 capacity in Table 1.4 translates into 10,292,000 metric tons per year as compared with the CPPA figure of 10,303,000 metric tons per year, a discrepancy of 0.1 per cent.[2] The Directory definition of *market* pulp as net production gives a capacity figure of 24,780 short tons per day for Canada which translates into 7,868,000 metric tons per year using the 350 day operating year definition. By contrast, the CPPA definition of *market* pulp gives 6,669,000 metric tons per year, implying that approximately 1,199,000 metric tons of Canadian net production (market pulp by the Directory definition) - about 15 per cent of the total - is not sold in arms-length transactions.

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[1]Canadian Pulp and Paper Association: *Reference Tables 1979*, 15.

[2]Ibid.

CHAPTER 2

MARKETS AND PRICES FOR NEWSPRINT KRAFT PULP AND SOFTWOOD LUMBER

NEWSPRINT

Destinations of Ontario Newsprint Shipments

Geographical flows of newsprint exhibit considerable regionalization. Within North America, west coast producers ship most of their product to the Pacific region and Asia. In 1978, 96 per cent of British Columbia's newsprint exports to the United States went to the western states, mainly California. By the same token, only 3-4 per cent of exports from the Atlantic provinces, Quebec, and Ontario to the United States found their way to western states. This compartmentalization of the North American continent is in sharp contrast to regional flows of woodpulp (discussed later in the present chapter) where British Columbia commands both a North American market and significant exports to Europe and the Pacific rim.

In both newsprint and woodpulp, North America penetrates European markets, but the major exporting regions differ. Unlike pulp, where the U.S. South and British Columbia dominate, eastern Canadian producers are responsible for the largest share of North American newsprint shipments to Europe. Despite the cost-competitive position of producers in the U.S. South, U.S. production is nearly all consumed domestically so that the essential trade link between North America and Europe consists of exports from the Atlantic provinces and Quebec. Scandinavian producers, suffering from the highest costs among major world producers, no longer serve the North American market on a regular basis. Canada sends about 80 per cent of its newsprint exports to the United States and about 9 per cent to the United Kingdom and western Europe.[1] Approximately 20 per cent of European imports of newsprint come from Canada. Of the rest, 70 per cent comes from the Scandinavian countries.

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[1]CPPA Reference Tables, Table 32.

Within North America, Canada's newsprint exports are focused on the northeastern and midwestern states. In 1978, two-thirds of Canada's exports to the U.S. went to these two regions. As Table 1.3 showed, Canada has substantial shares of consumption in these areas: 82 per cent of northeastern U.S. newsprint consumption and 86 per cent of the midwestern market. Our shares in the southern and western states are smaller.

There are five newsprint producers in the Northern Ontario region as defined in Chapter 1. For reasons of confidentiality, it has not been possible to obtain figures for production and exports of newsprint by region.[2] This deficiency of data does not, however, preclude inferences about regional trade patterns. Table 2.1 shows Canadian regional newsprint capacities for 1978 in millions of short tons, along with regional exports to the United States, derived from Statistics Canada data on merchandise exports. The ratio of regional exports to the United States to regional capacity gives a fairly clear picture of the relative export orientation of Canadian areas. The Atlantic provinces have the lowest ratio (.48) reflecting a substantial - and not unexpected - orientation to European markets. Quebec and British Columbia, with ratios of .73 and .72 reflect Canada's *average* trading pattern (the Canadian ratio is .72). Ontario, with a ratio of U.S. exports to capacity and production of .89, can be presumed to be almost completely reliant on the U.S. market.

The breakdown of Ontario's shipments to the United States is indicated in Table 2.2 for the years for which data are now available (1972-78). Ontario supplies about 16 per cent of United States newsprint demand, a ratio that has remained more or less stable during the 1970's. Our regional shares vary from 40-45 per cent of midwestern markets down to a very small, and variable, share of western U.S. markets. About 10 per cent of U.S. northeastern consumption is sourced from Ontario. The same data from which Table 2.2 was obtained permit estimates of the relative volumes of Ontario shipments moving into the four U.S. regions.[3] In 1978, 74 per cent of Ontario's exports went to the midwestern states, 16 per cent went to northeastern states, 7 per cent to the U.S. South, and 3 per cent to the western region of the U.S. In rough terms, the midwestern U.S. is dependent on Ontario

[2]Reed (1980) reports Ontario production at 1.94 million short tons in 1978.

[3]Statistics Canada *Exports* (65-202), Table 7.

for about half its newsprint consumption, while Ontario ships about three-quarters of its exports to those states. The major links are to the states of Michigan, Ohio, Illinois and Wisconsin.

Table 2.1

REGIONAL RELIANCE ON U.S. NEWSPRINT MARKETS

Region*	(1) 1978 Capacity (Millions of Short Tons)	(2) 1978 U.S. Exports (Millions of Short Tons)	(2)/(1) Ratio
British Columbia	1.51	1.09	.72
Ontario	1.94**	1.73	.89
Quebec	4.66	3.40	.73
Atlantic	1.57	.76	.48
Canada	9.86	7.07	.72

Source: Statistics Canada: *Exports* (65-202), Table 7. Values of exports divided by export price of newsprint to the U.S. from Table 4 (same publication) equal to $330.40 in 1978.

*Prairies not included in regional breakdown but included in Canada total. Only one mill is involved - Abitibi Price's Pine Falls, Manitoba operation.

**Equal to total Ontario production in 1978: Reed (1980), p.12.

Based on the data in Table 1.3, it is very probable that Ontario's share of northeastern and midwestern markets has declined over the last two decades. Ontario's share of *eastern* Canadian capacity (Canada excluding British Columbia) has fallen from 30 per cent in 1959 to 24 per cent in 1979. During the same period, Quebec's share of eastern Canadian capacity increased slightly from 55 to 57 per cent. Quebec is Ontario's most important competitor in the northeastern and midwestern area, supplying 62 per cent of consumption in the northeastern United States and 36 per cent in the mid-western area in 1978. Quebec seems to have resisted the incursion of U.S. producers in its traditional markets and

has retained its share of Canadian capacity quite effectively while larger shares of market growth in Ontario's traditional areas have been absorbed by competitors, mostly U.S. producers and, in all liklihood, Quebec mills as well.[4] The southernmost areas of the U.S. midwest - Kansas, Missouri, Illinois, Indiana, Ohio - are relatively accessible to shipments from the southern states. Commodity flows recorded by the Interstate Commerce Commission for newsprint and reported by Guthrie showed important northward flows to these states from Texas, Arkansas, Alabama, Georgia, and Louisiana.[5]

Table 2.2

ONTARIO SHARE OF UNITED STATES REGIONAL NEWSPRINT MARKETS
(PER CENT OF DEMAND)

	1978	1977	1976	1975	1974	1973	1972
Northeast	11.0	11.0	8.5	8.0	12.0	11.5	10.0
Midwest	44.0	46.0	41.0	35.0	43.0	47.5	43.0
South	3.0	3.0	3.0	2.0	4.5	4.2	3.0
West	2.5	2.0	1.5	1.5	.7	.2	.2
Total U.S.	16.0	16.0	15.0	12.0	17.0	17.0	15.0

Sources: Statistics Canada: *Exports* (65-202), Table 7. Export values divided by the export price of newsprint to the U.S. Regional definitions as in Table 5 of the present report.

Canadian Pulp and Paper Association: *Newsprint Data* (United States Demand by Region)

Note: Market flows were altered significantly by work stoppages in 1975.

[4] Quebec's position has to be viewed with caution since it relies on offshore markets to a significant extent so that part of capacity growth reflects its orientation to European destinations. Canadian exports to Europe have grown slightly more rapidly than exports to the U.S. over the last two decades.

[5] Guthrie (1971), 128.

Pricing Behaviour for Newsprint

The separation of markets noted in the previous section carries over into geographical price differentials in the newsprint industry. Within North America, three semi-official pricing areas prevail: the U.S. East Coast, with the list prices set at New York, the U.S. West Coast, and the prices quoted by some producers in the southern U.S. which can be lower than the New York list price.[6] New York list prices (Table 2.3) are the relevant ones for Ontario producers. European newsprint prices can and do diverge from North American east coast prices as well, reflecting higher costs of production in Scandinavia. Since U.S. southern producers have played a minor role in European markets, the link between North American and European prices rests in the pricing and output strategies of producing companies in the Atlantic provinces and Quebec.

The North American pricing system takes the form of price leadership. Most newsprint is sold under contractual arrangements. Production in eastern North America and in eastern Canada is relatively concentrated. Table 2.4 shows the proportions of capacity controlled by the largest three and largest five firms in the Eastern industry. Historically, the industry had reached a highly concentrated position by 1930 at which time the leading three firms had 45 per cent of capacity in Canada and the leading five firms had 65 per cent. In 1979, these ratios had hardly changed, with the top three firms controlling 48 per cent of eastern Canadian capacity and the top five controlling 63 per cent - proportions that would have been significantly lower but for the acquisition of the Price Company by Abitibi in 1975. The largest three firms in Canada in 1979 were the same firms that led industry capacity in 1930. The publishers with whom the producers deal are also relatively concentrated and, in a number of cases, are integrated backwards into newsprint capacity. The top 22 publishing groups in the United States account for about 50 per cent of total U.S. daily newspaper circulation and consume more than 50 per cent of newsprint used by all U.S. papers.[7] Publishers' trade associations - of which the American Newspaper Publishers Association (ANPA) is the most comprehensive - serve as an additional focus for publishers' interest in moderate

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[6] Dagenais (1976)

[7] DREE *Newsprint* (1978), 66.

Table 2.3

PRICE OF NEWSPRINT 1913-1980
($U.S. PER SHORT TON AT NEW YORK)

1913	$ 45.00	1947	88.50
1914	43.60	1948	97.67
1915	41.78	1949	100.00
1916	51.78	1950	101.00
1917	63.78	1951	111.00
1918	64.30	1952	121.00
1919	79.40	1953	126.00
1920	112.60	1954	126.00
1921	111.35	1955	126.00
1922	76.80	1956	130.00
1923	81.80	1957	133.00
1924	79.30	1958	134.00
1925	76.80	1959	134.00
1926	70.00	1960	134.00
1927	70.00	1961	134.00
1928	67.50	1962	134.00
1929	62.00	1963	134.00
1930	62.00	1964	134.00
1931	57.00	1965	134.00
1932	48.33	1966	136.92
1933	41.25	1967	140.50
1934	40.00	1968	142.00
1935	40.00	1969	147.00
1936	41.00	1970	152.00
1937	42.50	1971	157.33
1938	50.00	1972	164.58
1939	50.00	1973	175.00
1940	50.00	1974	210.00
1941	50.00	1975	260.00
1942	50.00	1976	282.50
1943	54.66	1977	302.50
1944	58.00	1978	320.50
1945	60.25	1979	375.00*
1946	72.25	1980	400.00**

Source: Newsprint Information Committee: Newsprint Facts (annual average contract prices for 32 lb. newsprint to 1973 and 30 lb. newsprint thereafter)

* price at December 1979.
**industry announced price for May 1/1980.

newsprint prices. Many Canadian newsprint producers include publishers' representatives on their boards of directors. In Ontario, two companies, the Ontario Paper Company and the Spruce Falls Power and Paper Company, are substantially publisher controlled. Guthrie described the compromise involved in contract price formation in the following way:

> "...the demand for newsprint is quite inelastic... since fixed costs in newsprint production are relatively large, excessive price competition is particularly disastrous in the industry. Furthermore, large newspaper publishers, because of their financial strength and ready access to the weapons of propaganda, are in a strategic position to exert pressure on newsprint producers to reduce prices. As a consequence, the producers of newsprint have customarily resorted to price leadership as a device for preventing excessive price competition"[8]

It is reasonable to assume that contract prices emerge as a guideline from an overlapping set of pressures exerted by producers and their customers. The view, frequently adopted by those who examine *only* the competitive structure of newsprint suppliers and by those responsible for competition policy in the United States and Canada, that newsprint prices are unilaterally set by producers acting as a loosely-knit cartel ignores the countervailing power of publishers and the public and political opinion that they are capable of influencing. Rates of profit have not been high enough, particularly in the Canadian sector, to warrant the one-sided view that newsprint prices reflect monopolistic control over markets.[9]

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[8]Guthrie (1971), 167.

[9]Relative profitabilities of newsprint producers in the U.S. and Canada for the 1967-1976 period show significant differences (DREE, *Newsprint* 1978, 159). The comparison is based, however, on a single U.S. producer (Southland Paper Company), the only southern U.S. producer specialized in newsprint for which rates of return could be calculated. Some Canadian producers - Great Lakes Forest Products, MacMillan Bloedel, Donohue, and Crown Zellerbach - have exhibited rates of profit comparable to, or not significantly less than, earnings by Southland. The industry has pointed out that after-tax rates of return on capital in the pulp and paper sector have generally been below the average of rates of return in other manufacturing sectors. See, for example, Barclay (1978), 10.

Table 2.4

INDUSTRIAL CONCENTRATION IN NEWSPRINT - EASTERN NORTH AMERICA
(000 SHORT TONS-1979)

Firm	Eastern North America Cap'y		Eastern Canada Cap'y	
Abitibi-Price*	2,111		1,952	
International Paper	1,427		1,133	
Bowaters Group	1,069		557	
Consolidated Bathurst	994		994	
Kimberly-Clark**	760		340	
Ontario Paper	700		700	
Southland Paper	625		0	
Kruger Pulp & Paper	486		486	
		8,172		6,162
Total All Firms		11,770		8,493
Largest 3 Firms Share		39%		48%
Largest 5 Firms Share		54%		63%

Source: Newsprint Information Committee: *Newspaper & Newsprint Facts*. The 3-firm and 5-firm shares apply to capacity shares of firms in the region in question.

* Excludes Price's interest in Boise-Price Southern Corp.

**Includes Spruce Falls Power and Paper in which Kimberly-Clark has a majority interest.

Past studies of the North American price formation mechanism have stressed the influence of unit variable costs and operating rates (Dagenais 1976; Schaefer 1979) in determining contract prices for newsprint. The Dagenais study attempted to predict New York list prices using quarterly information on costs and operating rates from 1933 to 1971. As a background to the present study, a report has been prepared by B.C. Beaudreau of the Department of Economics at Lakehead University with the object of predicting newsprint contract

prices from 1947 to 1977.[10] The unit variable cost series includes wood, labour, fuel, electricity, miscellaneous materials, and transportation, expressed in U.S. $. The series is a quarterly interpolated data set representative of the costs incurred in the Quebec industry and is denoted by the symbol WD. The quarterly operating rate for the Canadian newsprint industry is denoted by R. From 1947 to 1977, the New York contract price changed on 21 occasions, and the quarters during which price changed define the number of observations in the statistical analysis. Using ordinary-least-squares regression analysis, three of the results obtained by Beaudreau are as follows:

(1) $P(t) = 1.06\ WD(t-1) + 28.66\ R(t) \quad r^2=.975$

(2) $P(t) = 13.23 + 1.04\ WD(t-1) + 16.57\ R(t) \quad r^2=.975$

(3) $P(t) = 30.86 + 1.03\ WD(t-1) \quad r^2=.974.$

where P stands for the New York contract price. All the variables in equations (1),(2), and (3) were statistically significant at the 99 per cent level with the exceptions of the constant and the operating rate in equation (2). The r^2 coefficients indicate that the regressions 'explain' between 97 and 98 per cent of the variation in the contract price over the 30 year period studied. The explanatory power of the regressions is as high as the explanatory power of Dagenais' results, but the specification of the equations has been altered to avoid difficulties with correlation between one or more pairs of independent variables in the data set. Co-linearity does occur, however, between the constant term and the operating rate in equation (2) so that, on balance, there is a mild preference for equations (1) and (3), both of which have about the same explanatory power.

The average operating rate (R) during price-change quarters was .94 (94 per cent) while the average operating rate over the whole period was .92. Examination of the residuals indicates a slight element of autocorrelation, but the

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[10]B.C. Beaudreau, "An Econometric Inquiry into the Determination of Newsprint Prices in Canada: 1947-77" (March 1980). Copies available on request.

[11]Data from 1947 to 1971 were kindly provided by Marcel G. Dagenais of the University of Montreal and were extended to 1977 by Beaudreau. 1977 is the latest year for which published Statistics Canada figures are available for construction of the unit variable cost series.

significance of this is hard to assess since the observations contain gaps (those quarters when price did not change) and correction procedures have, therefore, not been undertaken.

The regression results do indicate that unit variable cost has been a reasonable predictor of long-run price trends until the mid-1970's and that a small role may also be assigned to the operating rate in triggering price increases. The coefficient on unit variable cost is not significantly different from unity so that, on the average, the Quebec industry has been able to cover increases in variable costs per ton of newsprint with price increases. In general, unit variable costs for existing newsprint mills will be subject to two offsetting influences: the effects of rising prices of variable inputs (labour, energy, power, etc.) assuming no technological change; and the effects of capital substitution (modernization) on the quantities of variable inputs per ton of newsprint assuming unchanged input prices. Both processes will have been at work during the 30-year period covered by the statistical analysis. Rates of profit on capital have been relatively low for many firms in the eastern Canadian industry in the 1960's and early 1970's.[12]

The appearance of the U.S. southern states as important competitors in the 1950's has produced a structural change in the industry. Since the early 1960's, the Canadian operating rate has been almost permanently lower than the U.S. operating rate (Chart 2.1). On only two occasions since 1961 has the Canadian operating rate equalled or exceeded the U.S. rate: in 1974 and again in the late 1970's. The U.S. South is a low cost location for inherent reasons (discussed in Chapter 3), but it is also a low cost region because its higher operating rates have allowed overheads to be spread more effectively, while the Canadian industry has suffered some of the consequences of the reverse pattern. In the late 1950's the cyclical behaviour of Canada's newsprint operating rate changed (Chart 2.1). Prior to that time, a reduction in the North American operating rate was accompanied by an increase in the Canadian *relative* to the U.S. operating rate. After 1955, any weakening of North American operating rates has been accompanied by declines in the Canadian rates relative to U.S. producers. This may be due to the relatively higher degree of publisher control over U.S.

[12]See also DREE *Newsprint* (1978), 224-25.

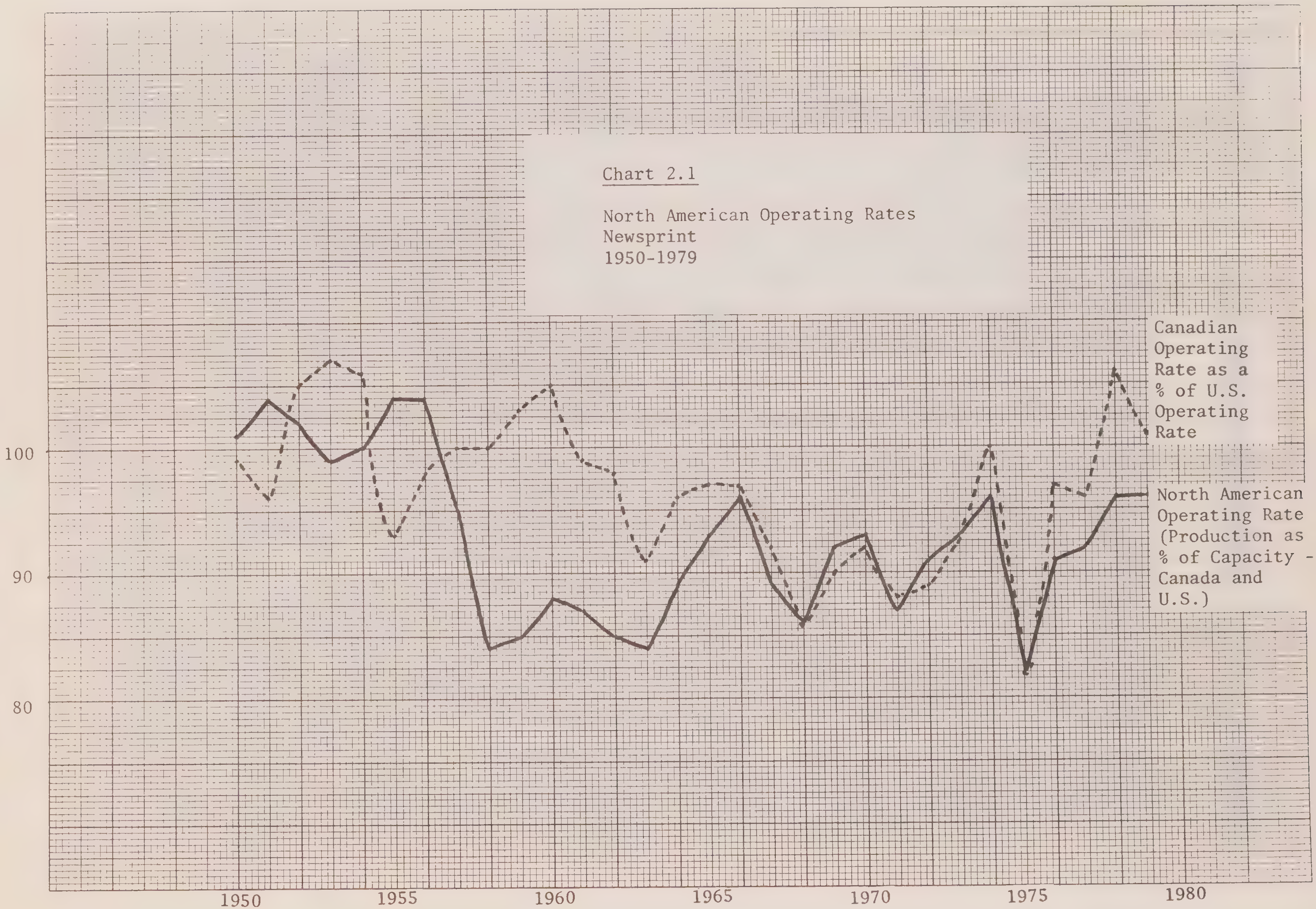

Chart 2.1

North American Operating Rates
Newsprint
1950-1979

newsprint capacity.[13] It is also true that unit variable costs are a good deal lower for the relatively new capacity in the U.S. than for the older facilities in eastern Canada, so the U.S. producers have a stronger cash-flow incentive to maintain high and stable operating rates and will be quicker to offer concessions to ensure a relatively high and stable rate of production. The co-existence of high costs and low unstable operating rates also appears in comparing North American and Scandinavian experiences in woodpulp production. (See the following section.)

The rapid growth of the U.S. southern industry placed downward pressure on North American *real* newsprint prices from the late 1950's to the early 1970's (Chart 2.2). The Canadian price leaders have been forced to recognize the cost advantages of U.S. rival producers and, by holding price increases close to variable cost increases in Eastern Canada, have attempted to respond to shifting regional cost patterns. Relatively low profitability for Canadian producers, slower capacity expansion, reduced market shares, lower and more variable operating rates have all been symptomatic of the pressures of the past two decades. In the process, the Scandinavian producers have been backed out of North America and the world pricing pattern has been further compartmentalized by the presence of higher prices in Europe than in Canada and the U.S. as Scandinavian producers faced shortages of wood in the 1970's.[14] Canadian producers in Quebec and the Atlantic provinces received different mill nets from their two major markets in 1978: for shipments to the U.S., the mill price was $331 per short ton, while shipments to the United Kingdom netted $383 per short ton.[15]

North American list prices for newsprint tend to be more stable than the export prices received by Canadian producers on their U.S. shipments. As Chart 2.3 illustrates, the period of high operating rates in the early 1950's was accompanied by a high ratio of export prices to list prices. By contrast, the mid 1960's, during which operating rates were lower, was a period of discounts. The list price was approximately constant, while the U.S. wholesale price index for newsprint

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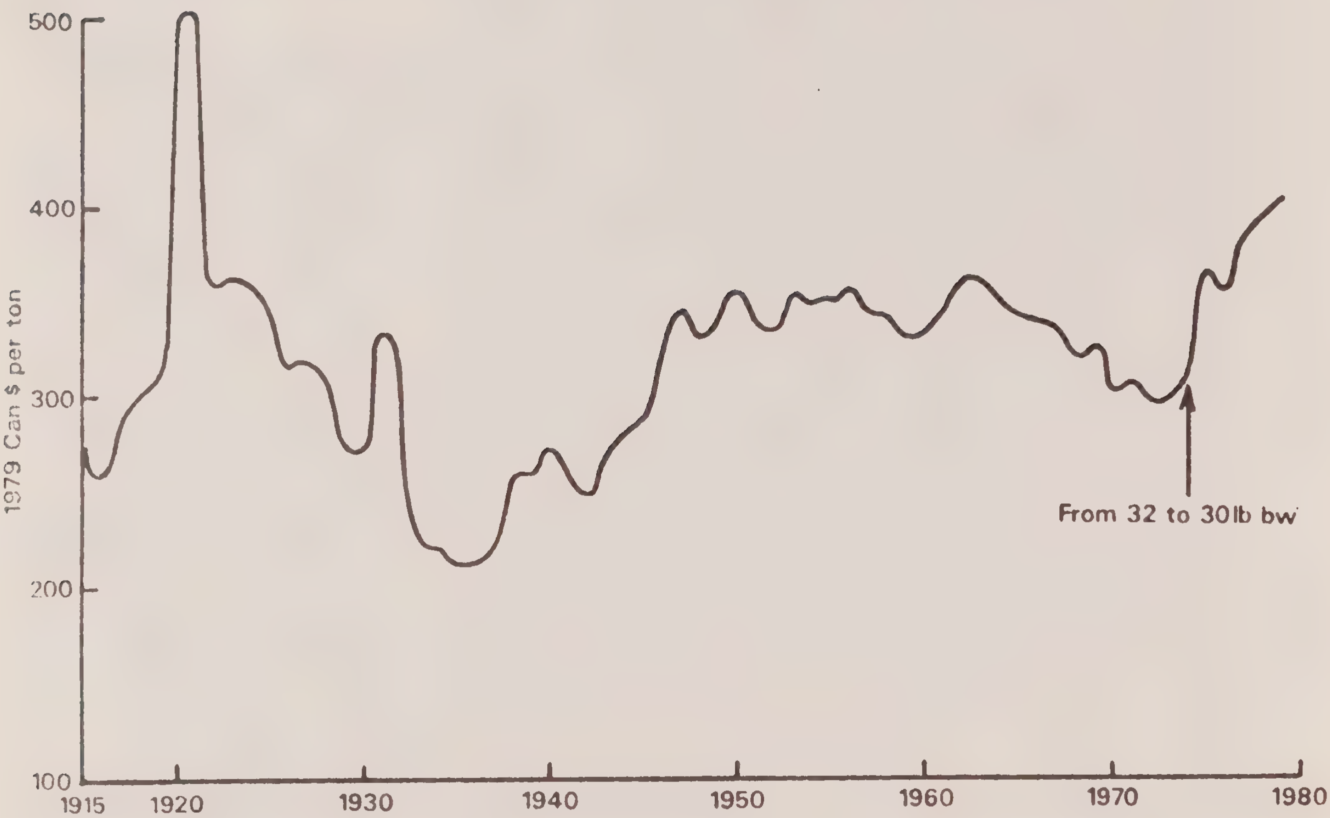
[13]Kates, Peat, Marwick (1973), p.65ff.; Industry, Trade and Commerce (1978), 71.

[14]DREE, *Newsprint*, p. 163 f.f.

[15]Statistics Canada, *Exports* (65-202), Table 4.

Chart 2.2 Real Newsprint Prices Over the Long Term



The New York list price expressed in Canadian dollars at the prevailing exchange rate. Deflated by the Canadian Consumer Price Index (1979 = 100)

Source: Pulp and Paper Canada, November 1979.

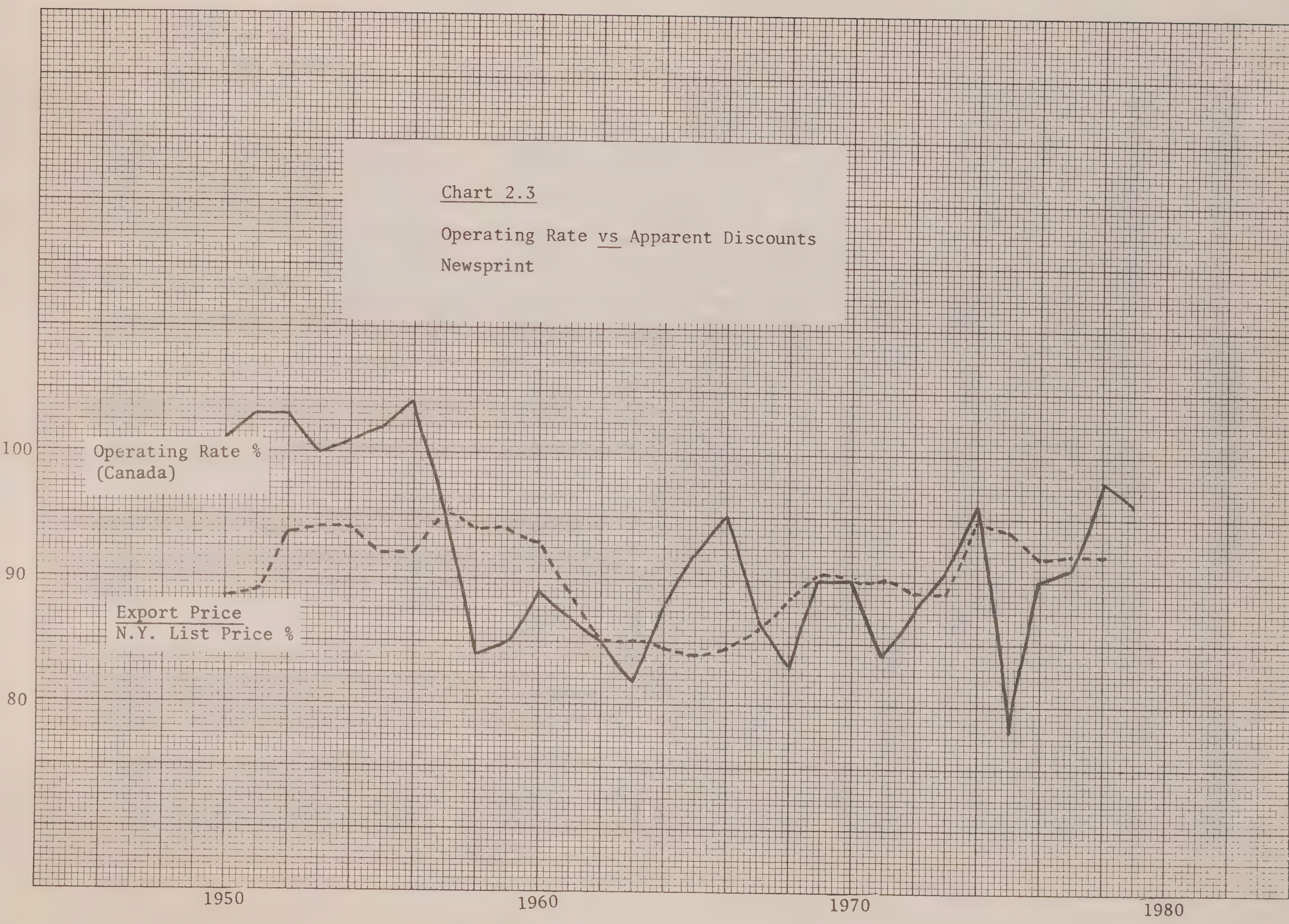


Chart 2.3
Operating Rate vs Apparent Discounts
Newsprint
Operating Rate %
(Canada)
Export Price
N.Y. List Price %
100
90
80
1950
1960
1970
1980

fell slightly from 1963 to 1965.[16] It is during this period that a list price decrease by MacMillan-Bloedel established a separate western price despite criticism from eastern producers. North American operating rates recovered after 1972 and the ratio of Canadian export prices to the New York list price is now over 90 per cent, as it was before 1960. When operating rates are weak, therefore, the list price is not an infallible guide to the prices actually prevailing in U.S. markets. When operating rates improve, however, the list prices become a firmer guide to transactions prices.

MARKET KRAFT PULP

Destinations of Ontario Pulp Shipments

Commodity flows in the woodpulp sector exhibit less geographical segmentation than for newsprint. European markets are much more important for Canadian producers of woodpulp, relative to U.S. markets, than for newsprint, and the North American market cannot be divided into areas of eastern and western influence. British Columbia, largely confined to U.S. west coast markets for newsprint, is a dynamic force in Europe and eastern North America in the area of woodpulp sales; and this pattern, together with substantial U.S. west coast pulp flows to eastern North America and the important position of the U.S. southern states in European markets, means that pulp prices are tied together internationally. One cannot speak of a North American - much less an eastern North American - price of pulp without referring to the price in western Europe. Chart 2.4, illustrating the movement of pulp prices in France and the U.S. since the war, shows the essential unity of pulp markets.

As the previous chapter pointed out, Canada sends only 50 per cent of its kraft pulp exports to the U.S., compared with 80 per cent of newsprint exports. The relatively strong European orientation of Canada's kraft pulp trade is not, however, shared by Ontario producers. In 1979, Ontario pulp mills produced nearly 2 million short tons of kraft pulp of which 1.3 million short tons were shipped to non-integrated paper mills and of the latter shipments, only 33,000 short tons or 2.5 per cent were to European destinations. The other 97.5 per cent of Ontario kraft pulp shipments went to affiliated and non-affiliated paper mills in North America, mostly in the United States. Over 80 per cent of market pulp produced in Ontario for sale in North America moves to United States destinations.

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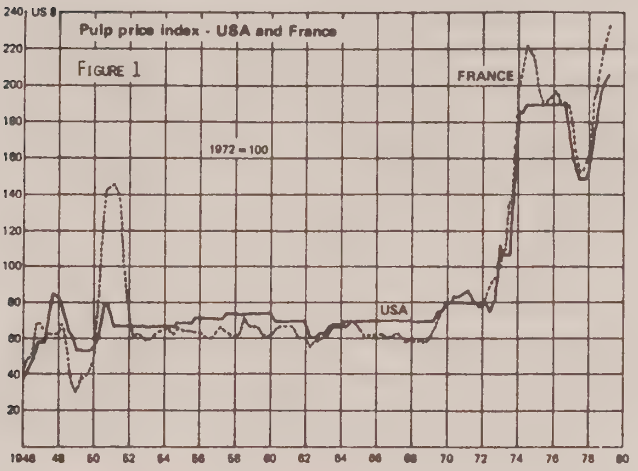
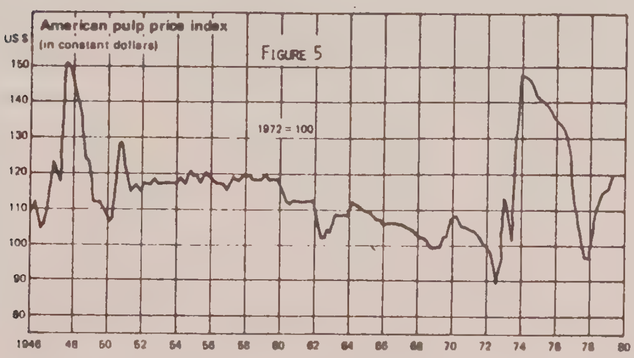
[16] Guthrie (1971), p. 175.

CHART 2.4

UNITED STATES PULP PRICES 1946-80



Pulp Prices in the U.S. and Europe



Constant Dollar U.S. Price

Source: B.Majani "Pulp Prices - A Plea for Stability" Pulp and Paper International, vol. 22, no.1, January 1980. The author does not report the deflator used for constant dollar U.S. pulp prices.

Table 2.5

ONTARIO KRAFT PULP PRODUCTION
(000 SHORT TONS)

	1979	1974	1969
Total Production	1,912	1,741	1,449
Used at Mills	628	551	424
Shipments (total)	1,300	1,157	1,036
- to North American affiliates	386	364	430
- to North American market	881	782	562
- to others	33	11	44

Source: Figures supplied by the Canadian Pulp and Paper Association, Woodpulp Section. Total shipments plus pulp used at mills does not add to total production owing to inventory changes.

Like the rest of Canada, Ontario specializes, within kraft grades, in bleached and semi-bleached pulp. Of the almost 2 million short tons produced in 1979, 84 per cent was in the bleached and semi-bleached categories.

Granted Ontario's complete dependence on U.S. markets for kraft pulp and its specialization in bleached and semi-bleached grades, it is also useful to examine the United States regions to which our exports are bound. Existing data do not permit U.S. regional destinations to be identified for kraft pulp alone, but the general pattern is evident from total woodpulp shipments from Ontario lading points to United States census sub-divisions. The latter sub-divisions can, in turn, be aggregated into the four U.S. regions identified for newsprint flows in the previous chapter (see Table 1.3 for definitions). This type of aggregation reveals that 58 per cent of Ontario's woodpulp shipments to the United States went to midwestern destinations, mostly in the states of Michigan, Ohio, Illinois, Indiana, and Wisconsin. Another 32 per cent moved to northeastern states, principally New York, New Jersey, and Pennsylvania. The remaining 10 per cent of Ontario's woodpulp shipments went mostly to U.S.

southern states.[17] Owing to the pre-eminent position of kraft pulp in woodpulp total shipments, it is reasonable to assume that these flow patterns fairly represent the U.S. regional destination pattern for kraft pulp.

From 1950 to 1978, woodpulp production in the United States increased from 15 million to 50 million short tons, while Canadian production increased from 8.5 million short tons to 21.6 million short tons. The southern states were largely responsible for the rapid U.S. relative growth rate, increasing production from 8 million short tons to over 33 million short tons - about 2/3 of present U.S. production. As previously discussed, most of Canada's growth is traceable to the rise of British Columbia and the huge capacity increases in that province during the 1950's and 1960's. Since 1970, growth in U.S. Southern and B.C. capacities has slowed slightly: from 1972 to 1978, Ontario has been able to maintain its share of Canadian woodpulp exports to the United States rather well. At the same time, however, Canadian woodpulp shipments to the United States grew more slowly (9.25 per cent from 1972 to 1978) than total U.S. woodpulp production (11 per cent over the same period). Table 2.6 shows the Ontario share of Canadian woodpulp exports to U.S. regions. On an overall basis, Ontario's share of the 1972 total was 24.9 per cent and had declined only slightly to 24.3 per cent in 1978 - the overall impression from Table 2.6 is a stable overall share, though it should be understood that the finer the level of regional disaggregation, the less short-run stability in shares is to be expected owing to the lumpy nature of capacity changes in the pulp and paper industry: The recovery of Ontario's share of exports after 1976 was probably related to two new pulpmills at Terrace Bay and Thunder Bay. These two major expansions dominated Ontario's kraft capacity development from 1975 to 1980 (Table 1.4).

At the regional destination level, Ontario's relative shares of woodpulp shipments to U.S. regions shifts from period to period reflecting work stoppages in various locations and the particular marketing strategies of a small number of firms. The figures in Table 2.6 do suggest that Ontario's markets have diversified slightly during the 1970's with its share of midwestern markets declining and shares in other areas increasing. This conclusion should be viewed with caution, however.

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[17]All data from *Statistics Canada:* Exports, 1978, Table 7 (65-202). Woodpulp shipments include negligable amounts of pulp produced from material other than wood.

Table 2.6

ONTARIO SHARE OF CANADIAN WOODPULP EXPORTS (%)

	1972	1973	1974	1975	1976	1977	1978
Total U.S.	24.9	24.4	23.3	24.3	20.3	25.9	24.3
Northeast	14.7	12.3	11.5	12.3	13.4	18.8	17.9
Midwest	41.9	43.6	41.8	40.7	31.2	38.1	35.6
South	10.9	12.2	15.0	16.3	9.1	15.3	17.7
West	1.7	8.7	.7	2.0	1.3	1.5	4.5

Source: Statistics Canada (65-202) *Exports* (Merchandise Trade), various. Table 7: Domestic Exports to USA by Commodity Category, Region of Lading and U.S. Census Sub-division.

Pricing Behaviour For Woodpulp

Price formation in the sulphate pulp sector is closer to the atomistically competitive ideal than in newsprint. This is partly because there are a larger number of producers in North America than in the newsprint sector and partly because North American and European producers compete actively enough to eliminate any major international price differentials (adjusted for transportation costs). The number of independent sellers of market pulp is hard to assess and varies with market conditions. Not all firms listed as shippers of dried pulp in Table 1.4 are shipping pulp in arms-length transactions and not all of those shipping to markets will be separately controlled decision-making units. Like newsprint, a large fraction of woodpulp is sold on a contractual basis for up to ten years duration. United States contract prices - shown for Canadian bleached and semi-bleached kraft pulp in Table 2.7 - are adjusted in line with market conditions with a slight lag and should be viewed as representative rather than definitive. Table 2.8 shows that U.S. import prices for bleached kraft pulp from Canada exhibit more flexibility than contract prices though the latter, unlike newsprint contract prices, can and do decline in response to conditions of excess

supply.* This observation in itself suggests that administered pricing, the characteristic method of price formation for newsprint, is relatively weak in pulp markets.

Table 2.7

LIST PRICES FOR CANADIAN KRAFT PULP IN THE U.S.
(U.S. $ PER SHORT TON)

1967	135-136
1968	135-136
1969	135-136
1970	155
1971	155
1972	155
1973	235
1974	321-335
1975	355-359
1976	355-359
1977	355-359
1978	355-359
1979	340-422
1980	445.50

Source: 1967-1978: American Paper Institute: *Wood Pulp and Fibre Statistics*, Book 1 (June, 1979) (Bleached and semi-bleached sulfate and soda grades from Canada)

1979-1980: *Paper Trade Journal* (bleached softwood kraft pulp from Canada)

None of the above should be taken to infer that pulp prices are set *perfectly* competitively. When one part of the international market fails to respond to excess supply, prices may take on greater downward rigidity elsewhere. In response to excess supply in 1974, Scandinavian producers attempted to

*As with newsprint, discounts were prevalent in the 1960's. See Daly (1969), pp. 41-42.

Table 2.8

KRAFT PULP PRICES IN THE UNITED STATES
($ U.S. PER SHORT TON)

	Bleached Kraft List	Bleached Kraft Imports
1950	122-141	122
1951	135-200	168
1952	142-150	160
1953	142-150	136
1954	142-150	133
1955	147-150	139
1956	152-155	143
1957	157-160	144
1958	157-160	144
1959	157-160	145
1960	145-150	141
1961	145-150	132
1962	130-142	128
1963	133-152	129
1964	145-155	136
1965	145-155	137
1966	145-155	134
1967	140-155	130
1968	140-155	125
1969	140-155	128
1970	150-174	141
1971	157-169	143
1972	157-169	138
1973	157-210	169
1974	200-340	276
1975	328-340	355
1976	328-340	350
1977	328-340	333
1978	328-340	279
1979	330-400	
1980	420-425	

Sources: American Paper Institute: *Wood Pulp and Fibre Statistics 1950-1978* Book 1. June 1979.
Paper Trade Journal, 1979-80.
Canadian Pulp and Paper Association: *Reference Tables 1979*, Table 28.

List prices are for bleached softwood kraft pulp manufactured in the U.S. and sold in the U.S. Import prices are U.S. prices paid for imports of bleached kraft pulp from Canada.

maintain prices through government subsidized increases in inventories. The result (Chart 2.5) was a large increase in inventories by Scandinavian producers, and North American producers, responding to Scandinavian leadership, held the line on contract prices in 1975 and 1976. In the event, U.S. actual prices were discounted below official contract prices in 1977 and the Scandinavian stabilization effort failed. The large inventory buildup led to an exaggerated decline in prices in 1977 and 1978 with the Scandinavians being forced to reduce operating rates drastically to remove the inventory surplus. Prices responded to excess supply, but with a 2 to 3 year lag. Price leadership is not completely absent in woodpulp though it is by no means the normal procedure as it is for newsprint. Occasionally, a large producer will initiate a price change, but market conditions operate to determine whether or not the change is accepted by the industry.

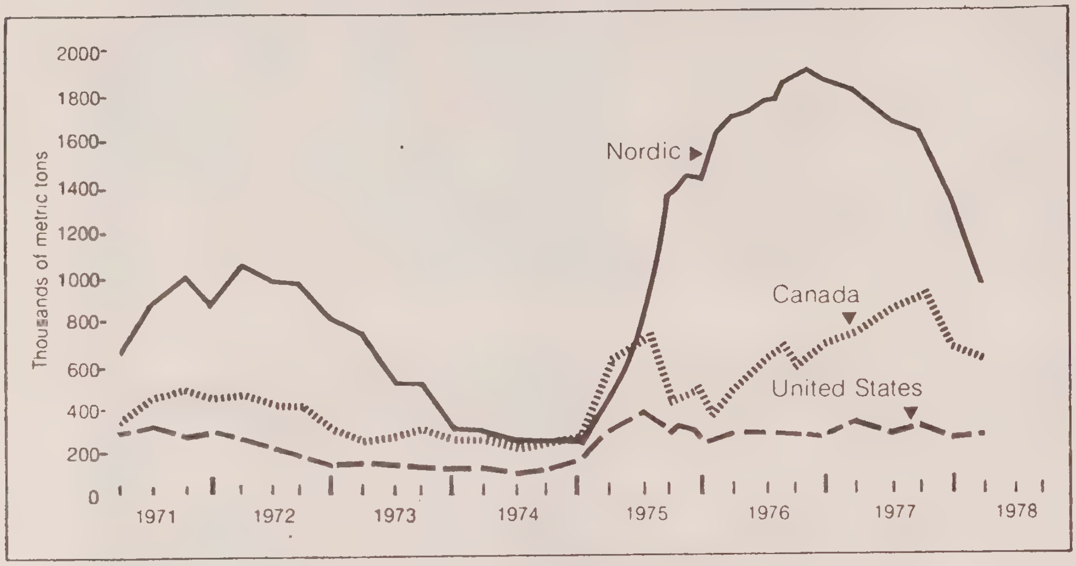
In any system of international markets in which price behaviour requires initiating moves by particular producers, it is reasonable to ask which regional producers appear to be the initiators. In the pulp market of the 1960's, evidence began to appear that North American producers were the initiators of price changes: "... the available evidence does not support the claim that the prices charged for European pulp imports set the domestic price for market pulp. Indeed, in recent years there has been evidence to the contrary."[18] Majani offers the stronger view that "... pulp is an international product and the American producers are the price leaders. It is an accepted and proven principle of marketing that the price leaders will always be the producers with the lower costs."[19] Scandinavian imports of woodpulp to the United States have been declining since the war and now account for an insignificant share of U.S. consumption. By contrast, North American exports of woodpulp to Europe have been increasing relative to Scandinavian supplies. From 1966 to 1975, Canada increased its share of European bleached kraft pulp imports from 15 per cent to 32 per cent, the U.S. increased its share from 16 to 19 per cent, while the Scandinavian share of European imports fell from 69 per cent to 49 per cent.[20] This is the type of behaviour to be expected

[18] Guthrie (1971), p. 163.

[19] Majani (1980), p. 46.

[20] DREE: *European Markets for Pulp and Paper* (1979), p. 105.

Chart 2.5



PRODUCERS' MARKET INVENTORIES OF CHEMICAL PAPER-GRADE PULPS

Source: Evans (1978).

as low cost producers - the U.S. South and British Columbia - move to secure domestic markets and then reach out to attract more distant customers from higher cost competitors, placing downward pressure on prices in the process.

The North American penetration of European pulp markets causes particular difficulties for the higher cost Scandinavian producers when excess supply develops due either to rapid capacity expansions or cyclical reductions in demand for dried pulp. During these periods, prices come under strong pressure from the low cost producers. To quote Majani again:

> "(As)... the cost differential between North America and Nordic pulps increased more and more,... the pulp market became subject to two opposite forces. On one hand, the Nordic producers became a *permanent force* to raise pulp prices in order to cover their highest costs. On the other hand, the North Americans were an *intermittent force* to bring down prices when market demand dropped."[21]

North American operating rates tend to be more stable than European rates as long as pulp prices are well above North American costs: when excess supply develops, the higher cost producers are forced into downtime, an effect already described in the relationship between Canadian and United States operating rates for newsprint. This behaviour is entirely expected so long as prices remain *on average* high enough to sustain high-cost producers alongside low-cost producers. The low-cost producers then find that full capacity operation is profitable for them at prices that are unattractive to their high-cost competitors.

North American cost leadership in chemical pulping has been documented in studies for the Canadian federal government.[22] These studies showed an advantage for the west coast and southern U.S. producers over Scandinavian producers in the range of $50 to $80 per short ton. Since chemical pulp is

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[21]Majani (1980), 46. Italics in original. Another study reports that, "During slack periods in the U.S. market... one notices a strong surge in U.S. export shipments, particularly to Europe... (since)... these producers can price their shipments on a marginal cost basis, they tend to act as the main price depressors on the European market" (DREE: *European Markets*..., p. 153). Surges of this kind occurred in 1970 and 1975.

[22]Sandwell Management Consultants (1977); Jaakko Pöyry and Associates (1978).

wood intensive relative to other pulp and paper products, it might be expected that such cost differentials are traceable to differences in wood costs, an expectation that is confirmed by the presence of wood cost differentials between preferred North American locations and Scandinavian locations of up to $100 per short ton - indeed, Scandinavian wood costs reported by Pöyry were essentially double the wood costs reported by Sandwell for British Columbia, the U.S. northwest, and the U.S. south.[23] More recently, Majani offered the view that Scandinavian total costs may exceed U.S. South total costs by $100 U.S. per metric ton ($91 per short ton).[24] An executive of a Swedish pulp producing company has estimated that delivered costs at Rotterdam of Swedish and B.C. pulp differ by about $25 per short ton in late 1979.[25] These estimates probably bracket the Scandinavian-North American cost differential at the present time.

The real price of woodpulp in the United States has not exhibited any noticeable upward trend since the war though frequent erratic movements are present (Chart 2.4). Sharp changes in price in this sector are to be expected since market pulp supplies can swing widely: increases in mills' own use or shipments to affiliated paper mills during periods of buoyant demand for paper products will sharply reduce pulp available for sale, while weakening paper markets will have the reverse impact. This 'surge-tank' effect magnifies the market price response to variations in the balance of supply and demand for paper products and leads to an industry-wide concern for pulp price stability, a concern that is hardly detectable in discussions of newsprint pricing.[26] In all

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[23] Pöyry (1978), 2; Sandwell (1977), 24. Northern Ontario costs, discussed in more detail later, were reported to lie between the costs in efficient North American locations and Scandinavia. See Chapter 3.

[24] Majani (1980), 46. Depreciation of the U.S. dollar and the Canadian dollar relative to the krona and the Finnish mark have added to North America's competitive edge as well.

[25] Brandstrom (1980), 80.

[26] A similar 'surge-tank' effect works on newsprint operating rates, however, as discussed earlier. Price inflexibility combined with regional cost differences tends to focus operating rate changes on the higher cost producers in response to demand and capacity shifts. Price instability owing to focused shifts in supply and demand has often been noted in Vancouver log market as well since log purchases tend to be a residual source of fibre supply for coastal producers.

likelihood, the 1980's will see a continuation of the trend toward increasing North American shares of European pulp imports. While pulpwood scarcity is definitely evident in Scandinavia, United States pulpwood prices have remained approximately constant in real terms for a very long period of time - indeed from the beginning of the present century to the mid-1970's. (Manthy, 1978). Part of the reason for falling real pulp prices in the 1960's was the rapid growth of North American production. This growth was accompanied by labour-saving innovations (such as the Kamyr continuous digester) and economies of scale as the new pulp mills moved toward the size range of 1,000 short tons per day capacity.

It would obviously be dangerous to attempt a firm prediction of kraft pulp prices - even in real terms - over the next decade or more. Much depends upon whether or not the low-cost areas of North America will continue to expand relatively without confronting serious shortages of wood supplies. Analyses of wood availability in these regions are quite uncertain. One major source of uncertainty on the Pacific coast involves the policies of the United States Forest Service and the British Columbia Ministry of Forests toward old-growth timber. Several studies have recommended an acceleration of old-growth harvests.[27] If this recommendation was followed, the price of wood chips to west coast pulp mills could be held down to low levels for some time with potential depressing effects on international pulp prices. Even without acceleration of harvesting, wood supplies were still not fully utilized on the west coast in the mid-1970's (comparing removals with calculated allowable cuts): Pearse concluded, in 1976, that the unallocated allowable cut was substantial in all forest districts.[28] In 1977, the allowable cut on public sustained yield units and tree farm licences in British Columbia (which account for virtually all of British Columbia's wood supply) was 29.6 million cunits of which 20.8 million cunits - 70 per cent - was harvested.[29] This percentage has increased from 58 per cent reported by

[27]For example: Pearse (1976), Clawson (1975), Clawson and Hyde (1974), Levy (1978).

[28]Pearse (1976), vol. 2, p.26.

[29]B.C. Ministry of Forests *Annual Report* 1977, Tables 13 and 15.

Pearse and some observers now stress the close balance between British Columbia's AACS and the rate of harvest as old-growth timber is drawn down.[30] In the western United States, annual harvests have tended to exceed annual growth according to the United States Forest Service and "... with 1970 levels of management, prospective increases in net growth would not be sufficient to sustain 1970 levels of timber harvests."[31] with the result that real stumpage prices are expected to increase in the 1980's. In the southern U.S., by contrast, growth exceeds removals and the "... generally favourable growth-removal balances indicate that eastern forests, and especially those in the South, can support larger softwood timber harvests."[32] Relatively elastic supply of wood from the southern states is the basic conclusion of a recent study undertaken by the Department of Regional Economic Expansion.[33]

The foregoing discussion gives a mixed impression of possible real wood cost behaviour in the 1980's. British Columbia and the U.S. South will probably continue to act as cost-leaders in European markets though it is improbable that British Columbia's share of European pulp imports can expand at historical rates. The existence of available wood supplies in the low-cost North American regions suggests that there is no reason to assume that real pulp prices will embark on a rising trend in the 1980's. If this view is tentatively accepted, the current price for contract deliveries of Canadian kraft pulp to the United States may at least offer a guide to the medium term returns available to producers in Ontario (in real terms). The final section of the present chapter centres kraft pulp projections on the present price in 1980 dollars.

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[30] Chambers and McLeod (1980).

[31] USDA Forest Service (1977), 170.

[32] Ibid.

[33] DREE *U.S. South "Limits to Growth"* (1978). Southern stumpage prices have been increasing, however, as major companies move to secure their own supplies. Inflation also creates the danger that wood supplies will be held off the market to take advantage of nominal gains in value as prices increase. Several Canadian producers believe that wood costs in the U.S. South will rise significantly in the 1980's.

LUMBER

Destinations of Ontario Lumber Shipments

Spatial flows of lumber depend very substantially on relative regional wood costs: up to 40 per cent of the cost of lumber is attributable to the cost of sawlogs. Lumber also involves fairly high transport charges so that high wood cost areas can survive and grow, based on nearby markets. In North America, British Columbia and the U.S. southern states enjoy the lowest wood costs and the former produces high-quality lumber. As a result, among the Canadian provinces, over 95 per cent of lumber exports from Canada to overseas destinations are from British Columbia. For all intents and purposes, Ontario manufacturers do not export lumber overseas.[34] Table 2.9 shows the 1966-76 breakdown of Canadian overseas lumber exports by province of origin: the dominance of softwood species and the province of British Columbia stand out clearly.

British Columbia also dominates the U.S. market for Canadian softwood lumber with 80-85 per cent of shipments. In contrast to overseas markets, however, Ontario and Quebec send significant volumes to the United States. As Table 2.10 illustrates, in 1976, Ontario shipped .57 million Mfbm of softwood lumber to the U.S. and .037 million Mfbm of hardwood, consisting of 7.4 per cent and 54.6 per cent, respectively, of Canadian exports to the U.S. With Ontario production standing at .96 million Mfbm of softwood lumber and .21 million Mfbm of hardwood lumber in 1976, U.S. exports accounted for 60 per cent and 18 per cent of production in these respective categories. From the standpoint of Northern Ontario, the important position of hardwood lumber is of limited relevance, however. Examination of the species composition of hardwood lumber production in Ontario reveals that nearly 75 per cent of production consists of maple and yellow birch - species not indigenous to the boreal forest of the north. From the Northern Ontario perspective, U.S. lumber markets essentially mean markets for spruce and jack pine.

As a high wood cost region, it is to be expected that Ontario would have a limited market 'reach' in the U.S. and Canada compared, for example, to British Columbia. The available statistical information bears out this contrast. Table 2.11

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[34] Statistics Canada - External Trade Division (reported in *Canadian Transport Commission* (1977), vol. 3, p.204).

Table 2.9

CANADIAN LUMBER EXPORTS TO WORLD MARKETS (EXCLUDING THE U.S.)
BY SPECIES AND BY PROVINCE FOR THE PERIOD 1966 - 75
(MILLIONS OF FBM)

Year	B.C.		Prairie Region		Ontario		Quebec		Atlantic		Total	
	SFTWD	HDWD	SFTWD	HDWD	SFTWD	HDWD	SFTWD	HDWD	SFTWD	HDWD	SFTWD	HDWD
1976	1,702	-	-	-	7	7	60	9	27	2	1,796	18
1975	972	-	-	-	7	5	33	9	21	2	1,033	16
1974	1,652	1	-	-	22	5	70	10	29	2	1,773	17
1973	1,568	-	-	-	17	6	37	5	12	1	1,634	12
1972	1,152	2	-	-	6	9	71	6	17	2	1,246	17
1971	1,325	-	-	1	5	6	45	6	26	3	1,401	15
1970	1,815	-	-	-	5	4	80	6	49	3	1,949	13
1969	1,156	-	-	-	5	3	29	6	30	2	1,160	11
1968	1,547	-	-	-	4	3	35	6	31	2	1,617	11
1967	1,653	-	2	-	6	3	72	4	64	2	1,797	9
1966	1,294	-	1	-	6	2	94	5	134	2	1,529	9

Source: Canadian Transport Commission:
Factors Related to the Transportation of Canadian Lumber
Vol. 3, p.204.

Table 2.10

REGIONAL SUPPLY OF CANADIAN LUMBER TO THE U.S. MARKET

SOFTWOOD

Year	Atlantic		Quebec		Ontario		Prairies		B.C.	
	MMFBM	%	MMFBM	%	MMFBM	%	MMFBM	%	MMFBM	%
1976	111	1.4	553	6.9	572	7.4	335	4.3	6,202	80.0
1975	80	1.5	433	7.9	417	7.6	262	4.8	4,261	78.1
1974	97	1.5	489	7.6	473	7.4	330	5.2	5,010	78.3
1973	132	1.6	640	7.9	507	6.2	494	6.1	6,417	78.3
1972	159	1.9	670	7.9	465	5.5	518	6.1	6,587	78.2
1971	146	2.1	591	8.5	341	4.9	381	5.5	5,520	79.1
1970	125	2.3	394	7.3	229	4.3	304	5.6	4,329	80.4
1969	140	2.5	425	7.7	220	4.0	287	5.2	4,415	80.5
1968	116	2.1	392	7.2	202	3.7	251	4.6	4,463	82.3
1967	77	1.7	204	4.5	127	2.8	195	4.3	3,923	86.7
1966	72	1.6	218	5.0	140	3.2	151	3.4	3,804	86.7

HARDWOOD

Year	Atlantic		Quebec		Ontario		Prairies		B.C.	
	MMFBM	%	MMFBM	%	MMFBM	%	MMFBM	%	MMFBM	%
1976	4.3	6.3	23.6	34.7	37.2	54.6	1.0	1.5	2.0	3.0
1975	2.8	5.3	19.7	37.3	28.5	53.9	0.6	1.2	1.2	2.2
1974	6.8	6.7	36.5	36.1	39.1	38.6	12.4	12.2	6.6	6.5
1973	7.0	5.1	51.9	38.0	53.5	39.1	17.5	12.8	6.7	4.9
1972	7.1	5.6	58.7	46.8	51.3	40.9	9.6	7.8	3.8	3.0
1971	9.3	7.1	63.7	48.5	53.1	40.5	3.0	2.3	2.0	1.5
1970	12.9	10.3	62.5	49.8	44.9	35.8	2.2	1.8	3.0	2.4
1969	15.7	9.8	73.4	45.8	64.0	39.9	2.4	1.5	4.8	3.0
1968	10.1	7.6	61.7	46.8	55.3	42.0	1.4	1.0	3.3	2.5
1967	11.2	7.8	63.7	44.5	62.4	43.6	1.7	1.2	4.2	2.9
1966	12.8	6.7	74.0	38.7	99.5	52.1	1.4	0.7	3.6	1.9

Source: Canadian Transport Commission: Factors Related to the Transportation of Canadian Lumber, Vol. 3, p.155.

shows that 74 per cent of lumber shipments originating in Ontario for the United States market are sent to the mid-western states - principally Michigan, Ohio, Illinois, Indiana, Wisconsin, and Minnesota. Another 15 per cent of our U.S. exports move to the states of the northeast, mainly New York and New Jersey. As a low-cost region, on the other hand, British Columbia has a sizeable share of geographically distant U.S. markets, including the north-east and southern states. For rail shipments, Chart 2.6 shows the enormous west to east sweep of B.C. shipments moving on Canadian tracks into the Prairies and Ontario before being routed south.

Table 2.11

PERCENT OF CANADIAN REGIONAL SOFTWOOD LUMBER SHIPMENTS TO THE U.S. SHIPPED TO U.S. REGIONS
- 1978 -

Canada/U.S.	Northeast	Midwest	South	West
Atlantic	87.7	2.5	9.1	.7
Quebec	71.4	18.1	8.2	2.3
Ontario	14.6	73.8	9.0	2.6
Prairies	4.6	65.5	25.5	4.4
Pacific	13.5	36.2	30.1	20.2
Canada	18.8	39.5	26.4	15.3

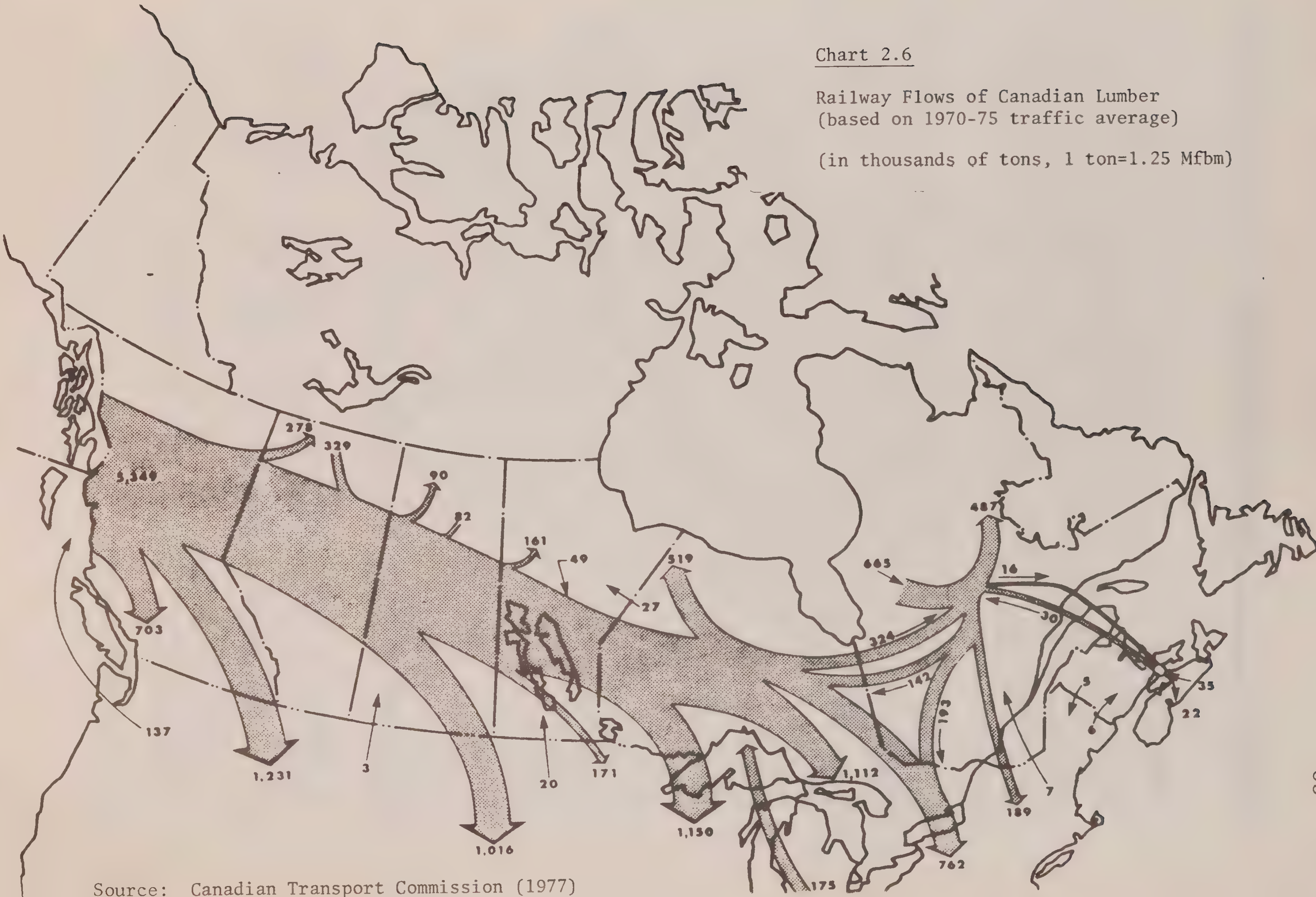
Source: Statistics Canada *Merchandise Exports* (65-202), Table 7. Percentages in value terms. For example, 87.7 per cent of the total value of Atlantic provinces softwood lumber exports to the U.S. destined for the Northeast U.S. Definitions of U.S. regions given in Table 1.3.

Northern Ontario sawmillers report that their most important urban lumber markets are Toronto, Detroit, Chicago, and Minneapolis. In general, lumber produced in Northeastern Ontario (the Hearst-Chapleau region) tends to move to Toronto, Detroit, and Chicago, while production in Northwestern Ontario goes to Chicago and Minneapolis. These market points serve as the basis for the transportation cost assumptions employed in Chapter 3.

Chart 2.6

Railway Flows of Canadian Lumber
(based on 1970-75 traffic average)

(in thousands of tons, 1 ton=1.25 Mfbm)



Source: Canadian Transport Commission (1977)

Lumber Prices

On a market structure continuum, North American newsprint markets lie in the oligopoly-oligopsony range, lumber markets are at the perfectly competitive end, and kraft pulp lies somewhere in between. In lumber markets, large numbers of independent buyers face large numbers of independent sellers so that all parties face prices that are distinctly beyond their control.

The present section discusses lumber prices from two perspectives: the long-run trend perspective and the short-run view during which prices are volatile. Chart 2.7 is an illustration of the long-term trend of U.S. lumber prices in real terms during the 19th and 20th centuries.[35] The trend rate of increase has been 1.7 per cent per annum. This behaviour contrasts with the evolution of real pulp and newsprint prices, neither of which have exhibited secular upward trends (Charts 2.2 and 2.4). In large measure, the difference resides in the relative scarcities of pulpwood and sawlogs. A recent study of long-term resource trends, undertaken by Manthy for Resources for the Future, shows that real pulpwood prices have remained constant for a century while real sawlog prices show evidence of depletion, rising (in real terms) at a rate of 2.12 per cent per annum.[36] The relative increase in sawlog vs. pulplog prices means that these two sources of fibre have to be considered as separate natural resources: logs of an adequate size for pulping are not necessarily large enough to be sawn even though sawmills have been adapting to smaller sized logs. Since the logging process itself is similar in both cases, it is fair to infer that resource depletion is taking place for sawlogs as trees in the larger size categories and more accessible locations are used up. Since up to 40 per cent of lumber costs can be attributed to the cost of the raw material, rising real sawlog prices account for most of the upward trend in deflated lumber prices.

The impact of resource depletion is particularly remarkable relative to other natural resources when it is realized that lumber consumption in the U.S. has hardly grown from the early part of the century to the 1970's:

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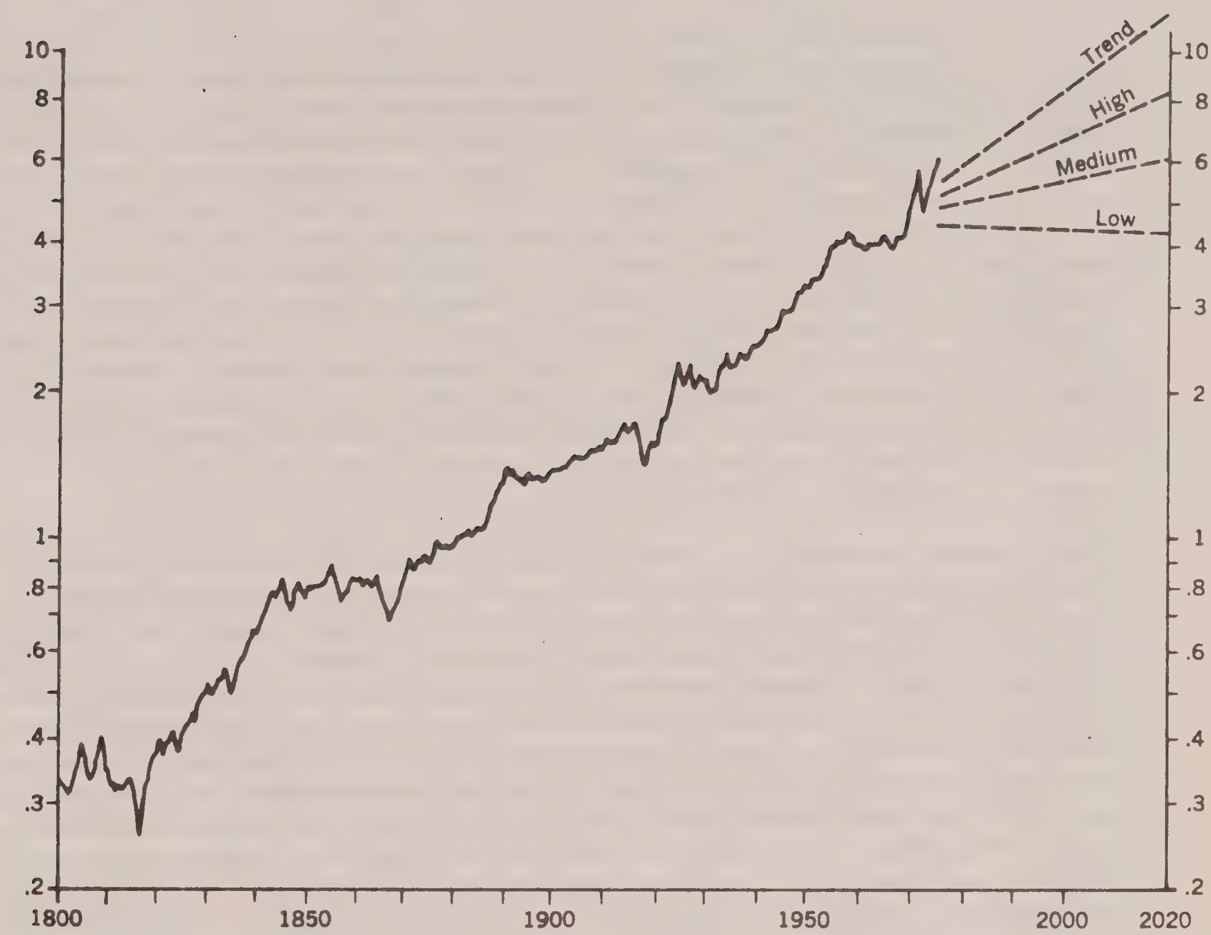
[35] Deflated by the wholesale price index for all commodities. Vertical axis of Chart 2.7 is in logarithmic form. See also USDA Forest Service (1977), p. 155.

[36] Manthy (1977, 1978).

Chart 2.7 United States Lumber Prices in Constant Dollars



Source: United States (1973). Report of the President's Advisory Panel on Timber and the Environment, p.40

> "Despite the very large expansion of major markets in construction, manufacturing, and shipping during the present century, lumber consumption in 1970 approximated the consumption level of the early 1900's. Presumably the increase in relative lumber prices - averaging 1.6 per cent per year in this period - was an important factor leading to increased use of substitutes..."[37]

One of the pressing issues in U.S. forest policy concerns the rate of removal of timber in the western National Forests. There is little doubt that accelerated harvesting of old-growth timber in Washington, Oregon, and northern California could, for several decades, arrest increasing real sawlog prices, but the U.S. Forest Service remains committed to its 'even-flow' policy and is supported in this policy by environmentalists and private woodland owners enjoying rising stumpage returns. With past history as a guide, North American real lumber prices will probably continue to advance at a trend rate not less than 1.5 per cent per annum, though, as Chart 2.7 makes clear, this is a trend that is subject to breaks and spurts. From 1950 to 1970, for example, real lumber prices remained approximately constant and then resumed trend increases in the 1970's.

From the viewpoint of sawmillers, long-term trends tend to fade into insignificance in comparison to the short-run instability of lumber prices. Up to 40 per cent of lumber shipments find their way into housing construction, with the balance used in non-residential construction, manufactured products, wood pallets, containers, dunnage, blocking, and bracing.[38] While long-term trends in residential construction reflect real income and demographic developments, variations in the cost and availability of mortgage credit introduce large fluctuations in the timing of housing expenditures. During periods of tight money or rapid growth in components of capital formation competing with residential construction for loanable funds, housing starts can decline sharply with accompanying reductions in the demand for lumber (the effect of tight money on lumber demand has been graphically illustrated by the events of early 1980). Studies of the demand for lumber are fairly unanimous in agreeing that its short-run

[37]USDA Forest Service (1977), p.155.

[38]USDA Forest Service (1977), p.143ff.

price elasticity is low (less than unity).[39] Mixed results are reported for its elasticity of supply. In the upward direction, supply responses to price are constrained by sawmill capacities and the availability of sawtimber. In the downward direction, sawmills, like other pure competitors, will shut down temporarily when price fails to cover the individual firms' average variable costs of manufacture, but these costs, in turn, are likely to decline as production falls off in those regions (the U.S. South and U.S. West Coast) in which stumpage prices are set by market forces and timber supplies are themselves inelastic. Mead's conclusion was that "{t}he supply function for lumber, while more elastic than that for timber, is still in the inelastic range."[40]

Inelastic supply and demand responses in lumber markets - as with agricultural products - mean that fluctuations in the demand for lumber stemming from shifts in the timing and magnitude of investment expenditures on housing and other components of capital formation translate into sharp fluctuations in price. This introduces an element of risk into the lumber industry and explains the development of a futures market in lumber on the Chicago Mercantile Exchange in the early 1970's.

As described in the previous section, Northern Ontario sawmills are heavily dependent on markets in midwestern and northern U.S. states and in the Toronto area. Though all North American prices are connected closely, prices in specific locations will exhibit variable differentials owing to transport costs and minor adjustment lags. Chart 2.8 exhibits prices in Northern Ontario's major domestic market and for northeastern United States markets. These prices are considered representative. The Toronto price series applies to partially air-dried 2x4 spruce and jack pine lumber with the federal government excise tax included.[41]

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[39] Mead (1966); Adams and Blackwell (1973); Robinson (1974).

[40] Mead (1967), p.73. In Canada, stumpage charges respond less promptly to variations in the demand for sawtimber since these charges do not emerge from market processes as they do in the United States. This tends to inject greater supply elasticity (in the downward direction at least) in Canadian lumber supplies through partial or complete mill shutdowns in weak lumber markets. To this extent, Mead's conclusion has to be modified in dealing with Canadian lumber supplies.

[41] *Knots and Slivers* (April 1980). See Appendix 2-A.

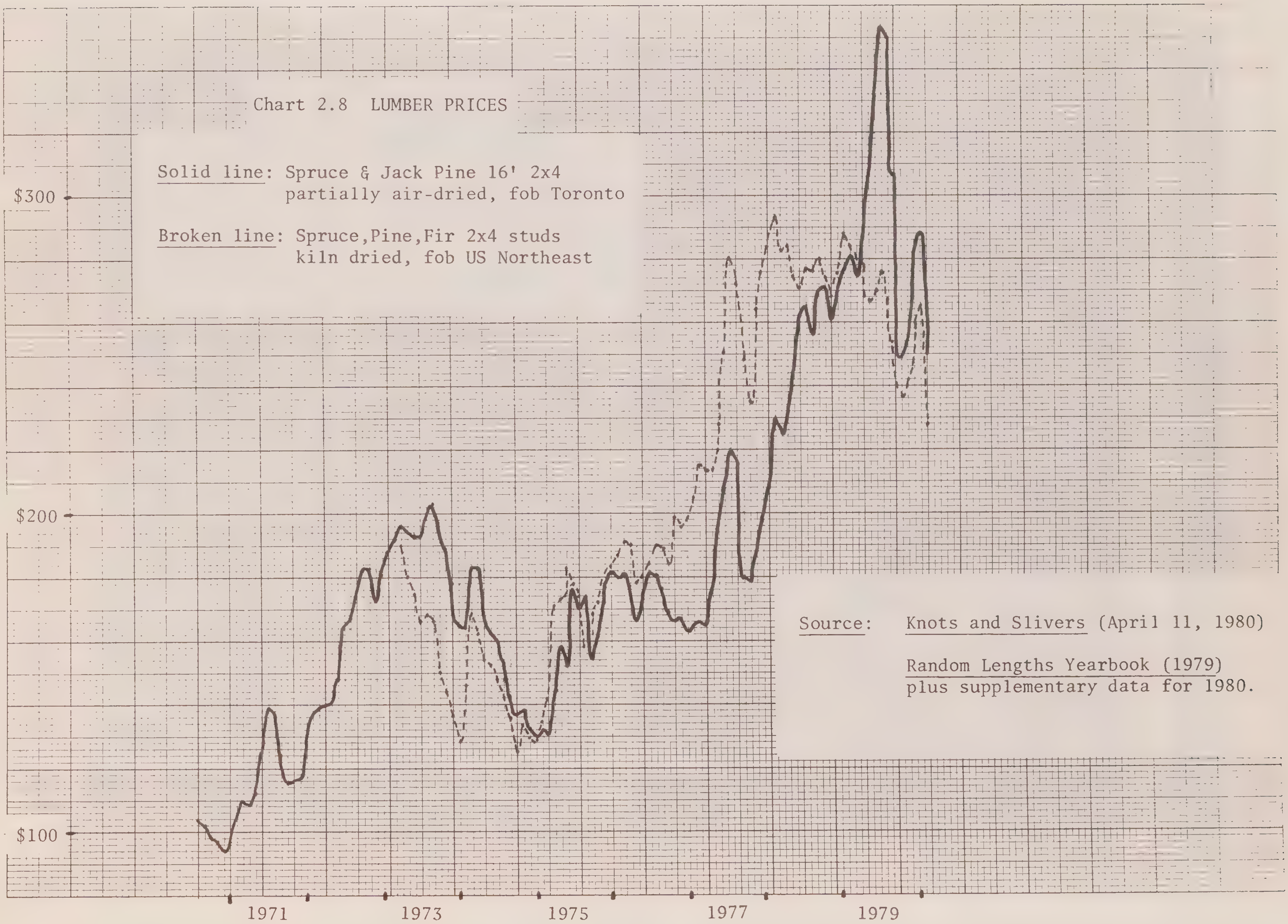

Chart 2.8 LUMBER PRICES

The northeast United States price series is for delivered 8 foot spruce-pine-fir studs converted from United States to Canadian dollars at prevailing exchange rates.[42] Under average conditions, the 16 foot prices are higher than the stud prices by about $15-$20 per thousand board feet (Mfbm). This relationship was disturbed by the depreciation of the Canadian dollar from the beginning of 1977 to the end of 1978. During this period, the Canadian dollar equivalents of U.S. northeast prices exceeded the delivered Toronto prices.

As Chart 2.9 shows, the 1970's have witnessed nearly two complete cycles in U.S. residential construction activity: investment and U.S. lumber prices rose from mid-1970 to peaks at the end of 1972. Prices and activity declined until late 1974 or early 1975 and then started up again to a peak in 1978, with subsequent declines reflecting the Federal Reserve Board's tight money policy. The Toronto price has followed the U.S. northeast cycles with a slight (six month) lag. This cyclical relationship between lumber prices and U.S. housing activity has been evident for a long period in line with the theoretical mechanism described earlier in the present section.[43]

EXCHANGE RATE AND PRICE PROJECTIONS

The dominant influence on Canada's international competitive position in the 1970's was the decline of the Canadian dollar from its par position with the U.S. dollar in the early 1970's to its present (spring 1980) position of $U.S.0.86. There is no doubt that this decline represented a much-needed step to restore cost competitiveness of Canadian exports and import-competing goods with United States industries. Indeed, the Canadian dollar was overvalued by 1974 and began to decline after mid-1974 (Chart 2.10). The decline was arrested and reversed by large capital inflows in 1975 and 1976 brought about by a widening of Canadian-U.S. interest differentials in favour of Canadian financial instruments. In the event, the Canadian dollar finally began to compensate for the deterioration of our competitive position in early 1977. The

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[42] *Random Lengths Yearbook* (1979) with supplementary data for the first quarter of 1980. Conversion from $U.S. to $Can. at the Bank of Canada's average noon spot rate (*Bank of Canada Review*, various issues). See Appendix 2-A.

[43] For the 1960's behaviour, see R.A. Daly (1969), Chart 9, (p.38).

Chart 2.9

Residential Component of Gross Private Domestic Investment - United States

Billions of 1972 $ U.S.

Source: US Department of Commerce: Survey of Current Business (various)

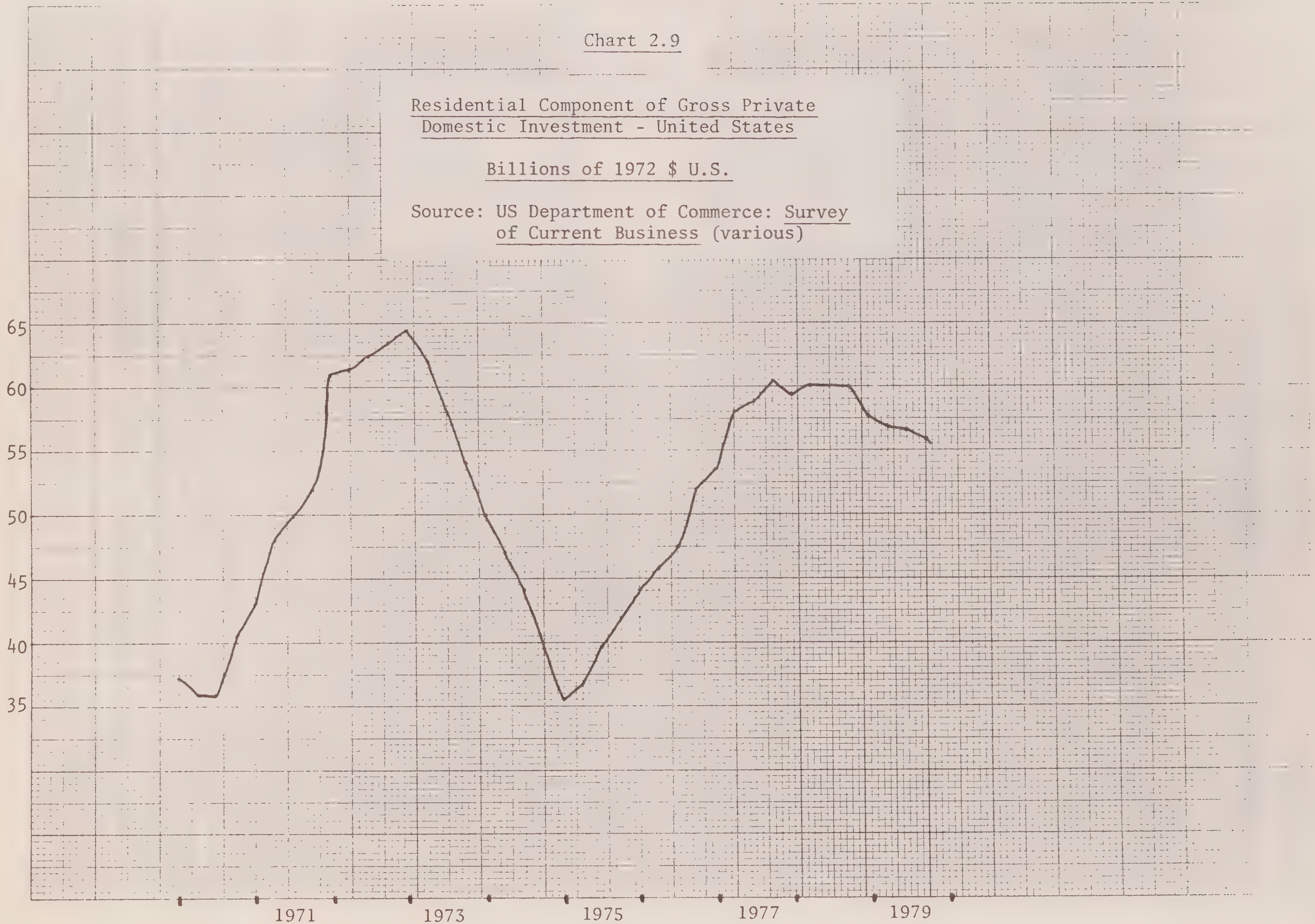
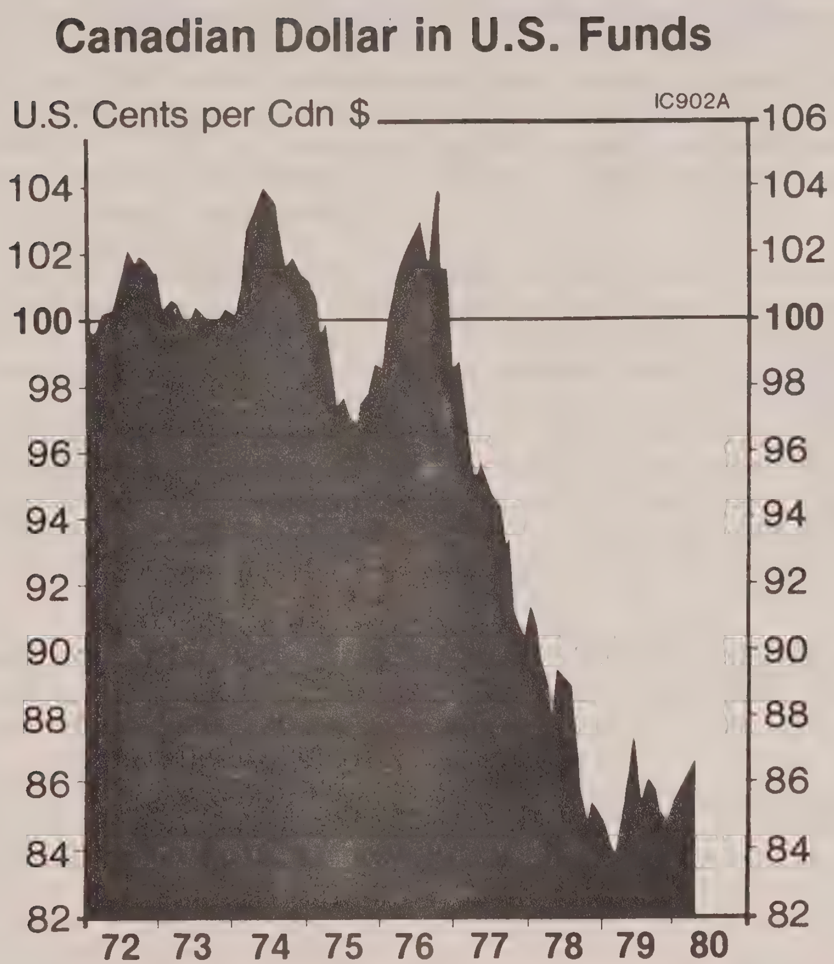


Chart 2.10



Sources: Bank of Canada; Royal Bank, Foreign Exchange Dept.

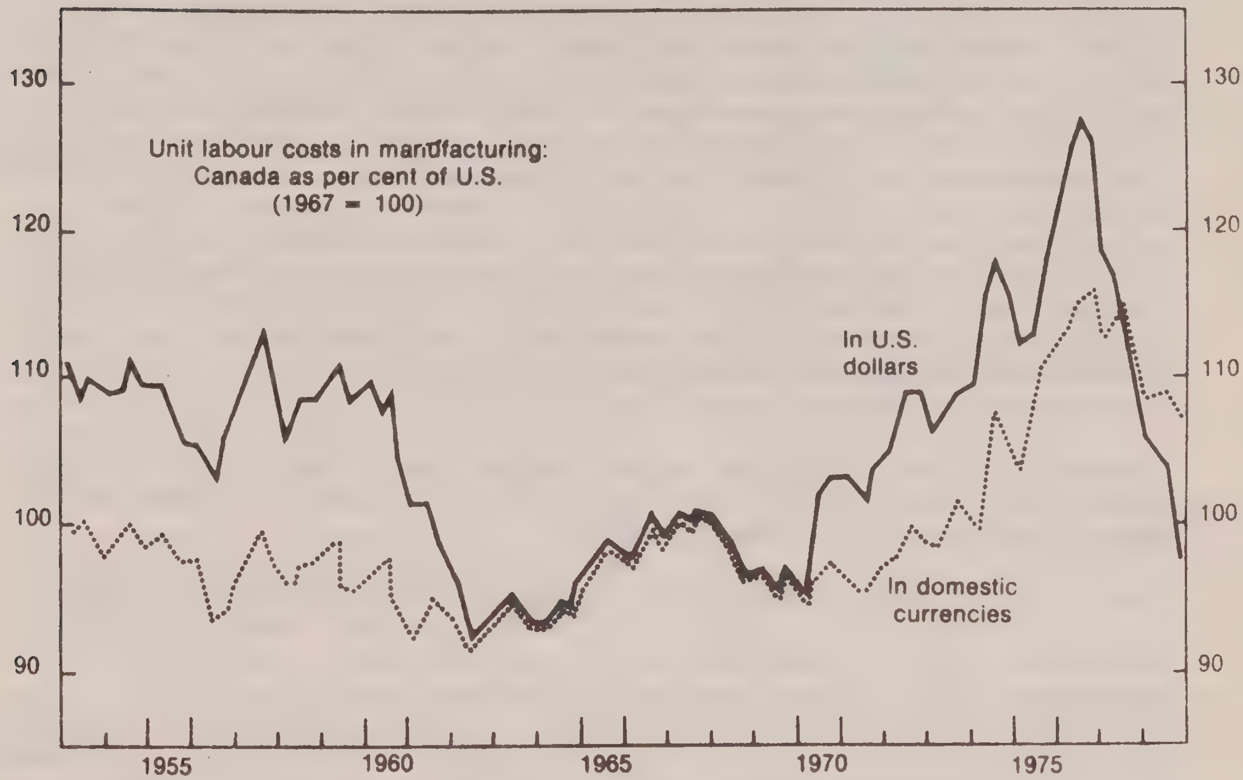
decline continued until the end of 1978. It is important to realize that the current exchange rate largely reflects cumulative differences in unit labour costs, built up over the early 1970's, in the two countries' domestic currencies. Chart 2.11 - taken from a recent treatment by Barber and McCallum - illustrates this point. In respective domestic currencies (the dotted line), Canadian unit labour costs in the late 1970's were about 110 to 115 per cent of U.S. costs compared to about 95-100 per cent in the 1960's. When Canadian labour costs are translated into U.S. dollars at the prevailing exchange rate, Canadian unit costs decline to less than 100 per cent of U.S. costs in 1978 - about the same level as in the 1960's when the Canadian dollar was at U.S. $0.925.

The evidence provided by Barber and McCallum supports the view that the most important function of a freely floating exchange rate is to compensate for differences in national unit cost positions denominated in domestic currencies. The experience of the early and mid-1970's illustrates, however, that factors other than relative costs denominated in domestic currencies can operate to determine short-run exchange rate behaviour. In particular, international interest rate differentials can induce capital flows that prevent the exchange rate from reflecting differential unit cost positions.

From the standpoint of relative unit costs, many observers feel that the appropriate range for the Canadian dollar is $0.85 to $0.90. For a major export sector like the forest products sector, two types of problems can arise. In the first case, the Canadian dollar continues to reflect relative average unit cost differentials between Canada and the U.S. while Canadian costs in the forest products sector are too high relative to U.S. costs in the forest products sector. From 1970 to 1979, average hourly earnings in Canadian manufacturing relative to U.S. manufacturing rose by 24 per cent (Table 3.2). Wage costs rose slightly *less* rapidly in pulp and paper: average hourly earnings in the Ontario pulp and paper sector rose by 20 per cent relative to U.S. hourly earnings in pulp and paper (Table 3.2). From the standpoint of wage costs therefore, the restoration of Canada's overall competitive position with the decline of the Canadian dollar after 1977 has also restored our relative wage cost position in pulp and paper. The second type

CHART 2.11

COMPETITIVE INDEX, CANADA VS. THE UNITED STATES, 1953–78



Source: Statistics Canada, Cansim and U.S. Department of Commerce, *Business Conditions Digest*.

From Barber and McCallum (1980), p. 65.

Unit labour costs defined as compensation per manhour divided by output per manhour.

of problem occurs when capital inflows (or other temporary features) lead to an exchange rate that is over-valued relative to unit cost differentials. This is the problem that plagued the forest products sector from 1973 to 1977, a problem shared by other export and import-competing industries in Canada.

The restoration of Canada's competitive position by the depreciation of the Canadian dollar in the late 1970's operates as the basis for our projections in Chapter 5. Given existing relative unit cost positions between the U.S. and Canada, an exchange rate of $0.85 (U.S.) to $0.90 (U.S.) seems a fair representation of near-term prospects. If Canadian costs again outstrip U.S. costs (or *vice-versa*), the exchange rate would have to compensate. A change of this kind need not damage or enhance prospects in the forest products sector provided its unit costs remain in line with unit costs elsewhere in the Canadian economy. Not all readers will agree with the $0.85 (U.S.) to $0.90 (U.S.) range. Accordingly, the results of our rate-of-return on investment analysis in Chapter 5 are reported for an exchange rate range from $0.80 (U.S.) to $1.00 (U.S.).

Turning to price projections, it is essential to establish plausible ranges for the U.S. dollar prices of newsprint, kraft pulp, and softwood lumber.

The list price of newsprint in New York is presently $400 (U.S.) per short ton (Table 2.3).[44] Current capacity expansion plans, combined with a general slowdown in the U.S. economy, will lower Canadian operating rates from their present high level (100 per cent). Several industry observers foresee a further decline in newsprint basis weight (see footnote 7). Excess capacity and lower basis weights have the effect of restraining price increases. An element of disequilibrium is also suggested by the results of the regression analysis discussed earlier in this chapter. The exchange rate depreciation after 1977 led to a much larger increase in Canadian dollar newsprint prices than could be predicted on the basis of late 1970's unit variable cost increases applied to the regression equation. As chart 2.2 illustrates, real newsprint prices rose to their highest levels in sixty

[44]The industry announced price level for May, 1980.

years. To allow for the possibility that newsprint prices could increase less rapidly than the general rate of inflation over the next few years, our projections use a price range of $375 (U.S.) to $400 (U.S.) per short ton in 1980 dollars.

Kraft pulp prices have traditionally exhibited greater downward flexibility than newsprint prices. Canadian bleached grades sold at about $445 (U.S.) per short ton delivered during the first quarter of 1980. In real terms, this price represents a sharp increase over 1978-79 prices (Chart 2.4 and Table 2.7). To capture both upward and downward influences, we have centred our projected range on $450 (U.S.) and have examined, in Chapter 5, a range from $435 to $465 (U.S.) per short ton in 1980 dollars.

The considerable volatility of softwood lumber prices has already been discussed together with the observed long-run trend in real lumber prices. Referring to chart 2.8, late 1970's 2 x 4 stud prices have been in the range of $230-270 per Mfbm in Canadian funds delivered with the Canadian dollar at about $0.85 (U.S.). This price range corresponds to a range of $195-$230 per Mfbm in U.S. dollars centred on $212.50 per Mfbm. The Chapter 5 projections begin with this average (higher than the current depressed level) and build in real price trends of 1.3 and 1.6 per cent per annum. The latter approximates the historical average rate of increase of real lumber prices (see Chart 2.7 and accompanying discussion).

Table 2.12 summarizes the delivered price assumptions to be carried over to the rate of return analysis in Chapter 5. Readers might prefer other assumptions concerning prices and these preferences can be accommodated to some extent by varying the exchange rate assumed. For example a bleached kraft pulp price of $435 (U.S.) per short ton at an exchange rate of $0.90 (U.S.) is equivalent to $411 (U.S.) at an exchange rate of $0.85 (U.S.). The following chapter develops detailed cost of production and transport figures for Northern Ontario, Quebec, and the southern U.S. states. The cost data enable comparisons to be made among alternative production locations in eastern North America and also serve, along with the price assumptions in Table 2.12, as essential inputs for the rate of return analysis in Chapter 5.

Table 2.12

DELIVERED PRICE ASSUMPTIONS (1980$)

	Newsprint (U.S. $/Short Ton)	Bleached Kraft Pulp (U.S. $/Short Ton)	Softwood Lumber* (U.S. $/Mfbm)	
Low	$375	$435	$195	$212.50
High	$400	$465	$230	
Range as % of Average	6.5%	6.7%	16.5%	

Source: See accompanying text.

* Subject to an assumed 1.3% or 1.6% rate of increase.

APPENDIX 2-A

LUMBER PRICES

The following tables correspond to the graphical material in Chart 2.8.

Table 2-A.1

EASTERN SPRUCE & JACK PINE PRICES
F.O.B. TORONTO, LESS 2% (CAN.$/Mfbm)
2 x 4 50% 16'
Const. (20% Std.) P.A.D.
Fed. Sales Tax Incl. Rail

1970:	Aug.	104	1974:	Jan.	165	1977:	Jan.	163
	Sept.	102		Feb.	164		Feb.	165
	Oct.	98		March	183		March	166
	Nov.	97		April	183		April	165
	Dec.	94		May	167		May	177
1971:	Jan.	97		June	162		June	196
	Feb.	104		July	160		July	208
	March	110		Aug.	153		Aug.	220
	April	109		Sept.	142		Sept.	216
	May	112		Oct.	137		Oct.	180
	June	125		Nov.	138		Nov.	179
	July	139		Dec.	132		Dec.	188
	Aug.	137	1975:	Jan.	130	1978:	Jan.	198
	Sept.	124		Feb.	132		Feb.	208
	Oct.	113		March	131		March	230
	Nov.	114		April	144		April	225
	Dec.	115		May	158		May	232
1972:	Jan.	127		June	152		June	246
	Feb.	137		July	176		July	262
	March	139		Aug.	170		Aug.	265
	April	140		Sept.	174		Sept.	256
	May	141		Oct.	154		Oct.	270
	June	148		Nov.	162		Nov.	271
	July	164		Dec.	177		Dec.	261
	Aug.	167	1976:	Jan.	182	1979:	Jan.	271
	Sept.	174		Feb.	180		Feb.	277
	Oct.	183		March	181		March	281
	Nov.	183		April	177		April	275
	Dec.	173		May	166		May	288
1973:	Jan.	181		June	173		June	305
	Feb.	188		July	181		July	332
	March	192		Aug.	180		Aug.	353
	April	196		Sept.	176		Sept.	350
	May	194		Oct.	169		Oct.	307
	June	193		Nov.	166		Nov.	249
	July	193		Dec.	167		Dec.	256
	Aug.	200				1980:	Jan.	281
	Sept.	203					Feb.	288
	Oct.	195					March	250
	Nov.	189						
	Dec.	178						

NOVEMBER 19, 1974 Fed. Sales Tax 5%.

SOURCE: *Knots and Slivers*, Apr. 11, 1980.

Table 2-A.2

EASTERN SPRUCE-PINE-FIR PRICES
(F.O.B. Northeast U.S.)
(Can.$/Mfbm)
(Studs, Kiln-dried, 2 x 4-8' PET, Stud Grade)

	1973	1974	1975	1976	1977	1978	1979	1980
Jan.		129	130	181	199	276	275	260
Feb.		147	135	187	205	284	288	265
March		169	141	191	215	293	284	228
April	190	162	171	190	213	283	276	
May	180	154	178	178	213	284	275	
June	175	152	175	179	228	275	267	
July	166	148	183	184	251	271	270	
Aug.	168	143	177	190	280	277	276	
Sept.	165	136	174	189	272	276	267	
Oct.	151	125	158	184	248	280	254	
Nov.	143	137	167	199	235	275	237	
Dec.	137	130	172	196	264	268	242	

Sources: *Random Lengths Yearbook* (1979) plus supplementary data for 1980. Converted to Canadian dollars at the Bank of Canada average noon spot rate *(Bank of Canada Review)*.

CHAPTER 3

MANUFACTURING COSTS

The objective in this chapter is to analyze the cost of producing newsprint, dried bleached kraft pulp and lumber in Northern Ontario locations. Because of the crucial influence that relative production costs exert on the geographic location of new productive capacity - and the continued operation of specific existing capacity - the analysis will also include an examination of the cost of production in Quebec and the U.S. Southeastern States, Ontario's main competitors in U.S. markets (see Chapter 2).

The derivation of estimates of production costs has, in part, been facilitated by a number of producers who supplied advice and confidential data on production costs.

Manufacturing costs are stated in each region's own currency unit - that is, Canadian costs are in Canadian dollars and U.S. costs are in U.S. dollars. Adjustments to take account of the lower exchange value for the Canadian dollar appear in the last section of this chapter.

WOOD COSTS IN THE PULP AND PAPER SECTOR

In Northern Ontario locations, we assume an average basic density for softwood of 24 bone dry pounds per cubic foot. With respect to roundwood, the laid-down cost of wood at the mill will be dependent on the organization of the cutting operation and the distance of the mill from the source of wood supply.

Mills located in Northern Ontario source their roundwood supply from the following distinct types of operations:

- company employed unionized crews cutting on licenced units and crown management units
- contract cutting on behalf of a company on licenced units and crown management units
- wood purchased from independent contractors.

It is to be noted that there is a large difference in the cost of sourcing wood from company employed union crews compared with wood supplied from contract cutting operations or independent contractors. Abstracting from transportation charges, the highest cost for wood is found in the case of company employed unionized crew operations. In general, non-unionized cutting operations result in a cost saving over unionized cutting operations of 25 to 35 per cent. This cost saving is largely due to lower fringe benefit costs and to the reportedly higher productivity of non-union crews.

The laid-down cost of roundwood at regional mills is reported to range between a low of $77 and a high of $100 per cunit for the period January-May 1980. A clear distinction must be drawn between pulpwood prices f.o.b. the mill and wood costs. The former does not include any costs related to overhead administrative costs, whereas the latter does. A study prepared for the Department of Industry Trade and Commerce in 1977 indicates that for Northern Ontario, administrative costs are between $5 to $10 a cunit.[1] The average wood costs per cunit are believed to be between $90 to $97. It must again be noted that wood costs vary considerably from mill to mill.

Most pulp and paper mills located in Northern Ontario source some of their fibre demand from sawmill chips. Sawmill operators have indicated that the current (February-May 1980) price for sawmill chips is approximately $60 per bone dry ton (b.d.t.) f.o.b. the sawmill. For spruce chips, the reported price is $65 a b.d.t, whereas for mixed spruce-jackpine chips the price is $50 to $53 per b.d.t. The average delivered price paid by pulp and paper mills is largely dependent on the distance that chips are transported. Mills located relatively close to sawmills will clearly be faced with a lower delivered chip cost than will mills located a considerable distance from the source of chip supply. The delivered price for chips is reported to be between $68 to $80 a b.d.t.

Almost all available information indicates that wood costs in Northern Ontario are considerably in excess of those prevailing in other regions of Eastern Canada and in the U.S. southeastern states. In Quebec, the reported average wood cost for roundwood is between $68 to $78 a cunit. The current delivered cost of chips at mills is between $70 to $90 a b.d.t. The high chip cost is in part due to the relatively large

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[1]See Peat, Marwick and Partners (1977).

distances that chips are transported and to the reduced supply of chips which stems from the current slowdown in lumber production. With respect to New Brunswick, average wood costs per cunit are between \$60 to \$70.

Wood costs in the U.S. southeastern states for pulpwood are reported to be between \$58 to \$66 a cunit at the mill. The price for softwood chips f.o.b. the sawmill is in the range of \$25 to \$35 a b.d.t., with a delivered cost of \$35 to \$42 a b.d.t.

Although there are large variations in wood costs within regions, wood costs in Northern Ontario are in excess of those prevailing in the remainder of Eastern Canada and the U.S. southeastern states. There are a number of reasons for this. First, the yield in cunits per acre is among the lowest in North America. The average yield per acre in Northern Ontario is 12-14 cunits, whereas in Quebec and New Brunswick the average yields are 14-17 and 13-20 cunits, respectively, and the average yield in the U.S. Southeast is 10-25 cunits (Peat, Marwick & Partners 1977).[2] Second, a very high proportion of woods labour in Northern Ontario is unionized. This is in sharp contrast to the pattern in the U.S. Southeast, where almost all cutting is undertaken by non-unionized labour. It is estimated that labour costs per hour in logging in the U.S. Southeast are between 55 to 60 per cent of the Northern Ontario cost. Based on data contained in the Peat, Marwick and Partners study (1977), the labour cost of producing 1 cunit of wood in tree length harvesting in the U.S. Southeast was \$6.25. The labour cost in Northern Ontario was \$16.67. (Part of the difference is due to higher productivity in the U.S. Southeast.) The same source indicates that camp costs are zero in the U.S. Southeast and \$1 to \$10 per cunit in Northern Ontario.

In order to provide realistic estimates of wood costs, account must be taken of the proportion of fibre needs that are sourced from sawmill chips as opposed to roundwood. In general, chip consumption is determined by the availability of chips and the type of production process being used in individual mills. The stone groundwood process used to provide much of the fibre for the production of newsprint needs a 100 per cent roundwood feed. In contrast, a high proportion of fibre for making kraft pulp can be sourced from chips.

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[2] The yield in Northern Ontario might not be *quite* this high. 11 cunits per acre appears to be the current view (see Chapter 4, fn4).

In Northern Ontario approximately 30 per cent of total fibre demand for the pulp and paper industry is sourced from chips. The use of chips varies considerably from mill to mill, with producers of dried bleached kraft pulp using significantly more chips as a proportion of total wood requirements than do producers of newsprint. In Quebec, chips form a significantly higher percentage of total fibre supply (approximately 41 per cent) than is the case in Northern Ontario. Much of the reason for this is, of course, the comparatively larger size of the Quebec lumber industry and hence the greater availability of chips. In the U.S. southeastern states, it is believed that a high proportion of the fibre for dried pulp is sourced from sawmill chips. Industry sources have indicated that with respect to pulp production, approximately 40 to 80 per cent of fibre needs are sourced from chips.

It is important to note that the wood costs given above are those reported for the period January-May 1980. The price for sawmill chips in most regions has been under upward pressure because of a slowdown in lumber production and also because pulp and paper mills have been running at near full capacity. A number of industry sources have opined that reduced sawmill activity in the southeastern U.S. states has been largely responsible for the recent low rate of increase in pulpwood costs in that region.

LABOUR COSTS

Table 3.1 shows average hourly earnings in pulp and paper mills for various locations for the period 1970 to 1979. It is immediately apparent that average hourly earnings in the British Columbia pulp and paper industry have been considerably in excess of those earned by pulp and paper workers in other provinces. It should be noted that the differentials vary on a monthly basis, but in recent years average hourly earnings in the British Columbia sector of the industry have been approximately 14 to 16 per cent higher than those in Ontario. Ontario hourly earnings have, in turn, been slightly in excess of those for Quebec.

A comparison of hourly earnings in Ontario and the United States indicates that labour earnings in the Ontario pulp and paper industry have in recent years been higher than the U.S. average for the industry.

During the period of managed exchange rates (1963-1969) when the Canadian dollar was pegged at 92.5 U.S. cents = $1

Table 3.1

AVERAGE HOURLY EARNINGS IN PULP AND PAPER MILLS

	NFLD.	Quebec	Ontario	B.C.	U.S.
1979	$9.66 CDN	$9.30 CDN	$9.69 CDN	$10.83 CDN	$8.31 US
1978	8.93	8.46	8.69	10.67	7.56
1977	8.99	8.15	8.42	9.67	6.72
1976	7.99	6.88	7.69	8.73	6.11
1975	6.64	5.91	6.14	7.60	5.55
1974	5.70	5.29	5.43	6.69	5.29
1973	4.92	4.56	4.67	5.47	4.67
1972	4.76	4.40	4.43	5.48	4.37
1971	4.48	4.15	4.16	4.91	4.05
1970	3.86	3.58	3.69	4.31	3.80

Canadian data is for wage earners employed in pulp and paper mills for the month of July of each year. Source: Statistics Canada 72-002. U.S. data for 1970-1977 is based on yearly averages. For 1978 and 1979 the data is July. Source: Employment, Hours and Earnings. U.S. Bureau of Labor Statistics.

Table 3.2

AVERAGE HOURLY EARNINGS IN MANUFACTURING AND PULP & PAPER EMPLOYMENT

	Canadian Manufacturing	U.S. Manufacturing	Ontario Pulp & Paper	U.S. Pulp & Paper
1979	$7.45 CDN	$6.72 CDN	$9.69 CDN	$8.31 US
1978	6.81	6.17	8.69	7.56
1977	6.40	5.68	8.42	6.72
1976	5.79	5.22	7.69	6.11
1975	5.07	4.83	6.14	5.55
1974	4.40	4.42	5.43	5.29
1973	3.85	4.09	4.67	4.67
1972	3.53	3.82	4.43	4.37
1971	3.27	3.57	4.16	4.05
1970	3.00	3.35	3.69	3.80

Sources: Canadian data: Statistics Canada 72-002; U.S. data: Employment Hours and Earnings, Bureau of Labor Statistics.

Canadian, hourly earnings in the U.S. pulp and paper industry were, when exchange differentials are taken into account, 8 to 13 per cent higher than hourly earnings in the Ontario pulp and paper industry. The upward float of the Canadian dollar between 1970 and 1976 eroded the advantage in wage rates. In 1976, the average hourly wage rate in the Ontario industry was $1.68 (U.S.) in excess of the average hourly wage rate in the U.S. industry - a differential of 27 per cent. The differential has, however, fallen during the period 1976 to 1979, partly because of downward pressure on the Canadian dollar (see Chapter 2).

It has proven somewhat difficult to obtain accurate data on average current earnings for workers employed in south-eastern U.S. pulp and paper mills. Much of the published data for individual states or census sub-divisions is relatively highly aggregated. Discussions with industry and U.S. Government representatives indicate that average hourly earnings of individuals employed in U.S. southeastern pulp and paper mills are in excess of the reported U.S. average earnings for the industry. The reported average earnings per hour at southeastern mills in 1978 was 45 cents higher than that given for the U.S. industry as a whole. For November, 1979, average hourly earnings are estimated at $8.85 per hour. It must be noted that average hourly earnings depend not only on the straight time wage rate, but also on the number of hours worked.

Employee benefit costs are an important component of total labour costs. For pulp and paper workers in Eastern Canada, these costs are estimated at 32 per cent of average hourly earnings. For the U.S. Southeast, a figure of 28 per cent has been assumed.

A comparison of hourly earnings in the pulp and paper industry in Canada and the United States with hourly earnings in total manufacturing employment in the respective countries indicates that average hourly earnings in pulp and paper are significantly in excess of those reported for total manu-facturing. Table 3.2 presents data on average hourly earnings in Canadian and U.S. manufacturing and average hourly earnings in pulp and paper employment. Average hourly earnings in pulp and paper employment in Ontario were, for 1973 to 1975, 21 to 23 per cent in excess of the Canadian average for manufacturing. For the period 1976 to 1979, the differential was between 27 to 32 per cent. For the U.S., the appropriate figures are 14 to 19 per cent for 1973 to 1975 and 17 to 22 per cent for 1976 to 1979.

THE PRODUCTION OF NEWSPRINT: EXISTING CAPACITY

A large proportion of the existing newsprint capacity in Northern Ontario is of very old vintage. A survey of existing capacity shows that very few machines in Northern Ontario mills are of post 1950 vintage. The greatest part of regional newsprint capacity is in machines that were installed prior to 1930. The "average" machine has a trim of approximately 200" and a speed of less than 2000 feet per minute (f.p.m.). Although a major part of capacity in Quebec and the Atlantic provinces is in old machines, the average machine trim and speed is in excess of that for Northern Ontario.

In contrast to the above, the bulk of newsprint capacity in the U.S. southern states dates from 1966, with the oldest machines being of 1940 vintage. An analysis of available data indicates that machine trim and speed in the U.S. South are greatly in excess of that present in Northern Ontario. Table 3.3 presents summary information on mean trim and speed for existing newsprint capacity in the two regions. It is readily apparent that the mean trim of machines in the U.S. South is approximately 80" larger than for machines in Northern Ontario, and that average machine speed is almost 1000 f.p.m. greater in the U.S. South than in Northern Ontario.

Table 3.3

COMPARISON OF NEWSPRINT MACHINES: N. ONTARIO AND U.S. SOUTH

	Mean Trim	Standard Deviation	Mean Speed	Standard Deviation
Northern Ontario	192"	62"	1930 f.p.m.	519
U.S. South	270"	46"	2900 f.p.m.	550

Differences in machine speed and trim have a direct impact on productivity. The "average" newsprint machine in the U.S. South has a daily capacity that is approximately double that of an "average" machine in Northern Ontario.

Labour Costs

A number of reports prepared by consulting firms indicate that newsprint mills in the U.S. South have an average labour input requirement of between 5.2 to 4.8 man hours per finished ton of newsprint. The same sources give an average labour requirement for Eastern Canadian mills of between 5.9 to 5.8 man hours per finished ton of newsprint.

An analysis of the basic data available to us indicates that the difference in labour input requirements per finished ton of newsprint between mills in Northern Ontario and the U.S. South is considerably larger than might be inferred from the consultants' reports. For the U.S. South, total labour inputs per finished ton of newsprint varied between a high of 4.6 man hours to a low of 3 man hours. The largest part of regional capacity in the U.S. South appears to have a labour requirement of between 3.5 to 4 man hours per finished ton. With respect to Northern Ontario capacity, labour input requirements varied between a low of 5 man hours and a high of 8 man hours per finished ton. The lower figure is representative of mills with newsprint machines installed in the late 1950's, whereas the higher figure is representative of mills with newsprint machines of very old vintage.

Labour costs for existing capacity in Northern Ontario and the U.S. southeastern states are shown in Table 3.4.[3] It must be noted that labour costs are very mill specific and thus the derivation of "average" labour costs for regional production is at best of dubious value. In consequence Table 3.4 provides estimates of labour costs with respect to what is believed to be representative ranges of manning requirements.[4] It is, however, argued that with respect to the U.S. Southeast, where a large proportion of productive capacity is relatively homogeneous in age and size, the most probable range for labour costs per finished ton is between \$50-\$60 U.S.

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[3] Labour rates are estimated average hourly earnings for November, 1979.

[4] In a 1977 report, Sandwell Management Consultants report a 1976 range of labour costs (excluding administrative costs) for Eastern Canada of \$39 to \$65. It is believed that the sample of mills was, however, small.

Table 3.4

LABOUR COSTS FOR EXISTING NEWSPRINT CAPACITY

	N. Ontario	Quebec	S.E. U.S.A.
Labour Inputs: Man Hours			
Production	5-8	5-8	3-4.6
Salaried	1	1	1
Labour Rates: Per Hour			
Production	\$9.75 CDN	\$9.33 CDN	\$8.85 US
Salaried	\$10.00 CDN	\$10.00 CDN	\$7.00 US
Fringe Benefits (Per Cent)	32	32	28
Labour Costs/FT	\$77-\$116 CDN	\$74-\$111 CDN	\$43-\$65 US

Mills in Northern Ontario of very old vintage face considerably higher labour costs than does the "representative" mill in the U.S. Southeast. The difference in labour input requirements can be seen from the following example. We assume a daily capacity of 450 tons of newsprint, with all furnish being supplied from within the plant. An output of 450 tons a day can be produced with 3 machines of 160" width and a speed of 1600 f.p.m.; or with 2 machines of 235" width and a speed of 1600 f.p.m., or with a single high speed twin wire machine of mid-1970's vintage. The mill using the twin wire will require approximately 2½ to 3½ total man hours per finished ton of newsprint, compared with 7½ or 8 total man hours for the mill with the 3 160" machines. The reduction in labour requirements for the replacement of the 2 235" machines by a modern twin-wire will be of the order of 3 man hours per ton.

Wood Costs

In Northern Ontario, a high proportion of mills are using a "high" yield sulphite process to provide 25 to 27 per cent of the pulp furnish, with the remainder being supplied from a groundwood process. The typical yield from the sulphite process is in the range of 60 to 70 per cent and for the

groundwood process the reported yields are in the range of 94 to 96 per cent. The majority of mills in Northern Ontario, and those in other parts of Eastern Canada, will have a wood requirement of between .95 to 1 cunit of wood per finished ton of newsprint.

In the U.S. southeast states, the predominant mode of production is to use semi-bleached kraft pulp to provide the chemical pulp furnish. The yield for semi-bleached kraft pulp is of the order of 45 per cent. However, the wood requirement in cunits per finished ton of newsprint will be below that given for mills in Eastern Canada primarily due to the higher basic density of Southern pines. Based on a density of 30 lbs. per cu. ft., the wood requirement for newsprint production in the U.S. Southeast is estimated at .92 to .93 cunits per finished ton of newsprint.

Estimated wood costs per finished ton of newsprint are given in Table 3.5. It must be noted that the costs given in Table 3.5 are what we believe are representative for the industry. Individual mills in each region will have costs that are outside the range given in the table.

Table 3.5

WOOD COSTS PER FINISHED TON OF NEWSPRINT: EXISTING CAPACITY

	N. Ontario	Quebec	Southeast U.S.A.
Wood Requirement (Cunits)	.95-1	.95-1	.92-.93
Per Cent Chips	10	15	15
Wood Cost	\$85-\$95 CDN	\$68-\$82 CDN	\$52-\$60 US

Energy Costs

The cost of energy is an important element in the total cost of producing newsprint. It is estimated that the production of newsprint from sulphite chemical pulp and groundwood pulp in Eastern Canada requires an input of approximately 1750 KWH of electric power and a steam requirement of 8000 lbs. per finished ton of newsprint. For mills located in the U.S. Southeast, the electrical power requirement would be in the

region of 1950 KWH per finished ton of newsprint, with the steam requirement being approximately 7000 lbs. per finished ton. Clearly, the coefficient given above will vary from mill to mill.

The cost of energy for producers located in Northern Ontario will vary from mill to mill, depending in part on the amount of steam that is generated from hogged fuel and the proportion of electrical power generated within the mill. A survey of available data indicates that mills in Northern Ontario generate between 10 to 40 per cent of the steam requirement from hogged fuels. The balance of the steam requirement is sourced from natural gas and coal. With respect to mills located in Quebec, the reported range for steam generation from hogged fuel was 0 to 40 per cent. Steam balance requirements were met from oil. In the U.S. Southeast, mills generate between 10 to 30 per cent of the required steam from hogged fuels. The balance of the heat demand is sourced generally from natural gas and oil, with a small number of mills using coal to provide a portion of the heat requirement.

With regard to electrical power, mills in Northern Ontario generated between 0 and 85 per cent of their electrical power inputs, with a similar range reported in Quebec. On average, mills in Northern Ontario generate a higher proportion of power needs than do Quebec mills. A representative average for self-generated power in Ontario newsprint mills is in the region of 25 to 30 per cent, whereas in Quebec the average would be around 10 per cent. It must be noted that the deviations from the mean are, however, extremely large.

Almost all mills in the Southeastern U.S.A. generate a significant portion of their electrical power requirements internally. The mean proportion generated internally is of the order of 50 per cent.

Northern Ontario mills face a current price for purchased electrical power of close to 2 cents a KWH. Mills located in Quebec face a price of between 1.35 to 1.5 cents a KWH. Although power rates vary from state to state, the average price for electrical power for mills located in the U.S. southeastern states is 2.5 cents a KWH.

It is estimated that the cost of energy for an "average" mill located in Northern Ontario will be of the order of $42 per finished ton. The estimated costs for Quebec and southeast U.S. mills are $36 and $47, respectively. It should be noted that these costs are not mill specific: actual costs will vary around the estimated costs on an individual mill basis.

Maintenance And Operating Supplies

The cost for operating materials, such as paper machine clothing and wrapping materials, is estimated to cost $15 per finished ton of newsprint. There do not appear to be any significant differences in the above cost across regions. The estimated cost for maintenance materials per ton of newsprint is $10. Again, there do not appear to be any significant differences across regions.

Sales And Head Office Expenses

Sales expenses have been reported to be between a low of $2.00 and a high of $5.50 per ton. For the purpose of our calculations, a figure of $5 is assumed. With regard to head office expenses, we assume a cost of $4 per ton. It must be noted that such expenses will clearly vary from company to company.

Property Taxes And Insurance

These are estimated at $4 per ton for Eastern Canadian mills and $3 per ton for mills located in the U.S. southeast states.

Transportation Costs

For the purpose of estimating transportation costs for newsprint, it is assumed that mills located in Northern Ontario will ship a large proportion of their total output to market points in the U.S. Midwest and that mills located in Quebec will ship the majority of their output to U.S. Eastern Seaboard market points. With respect to the output of mills located in the southeast U.S.A., we assume that the bulk of shipments will be to destinations within the south and to points in the lower Midwestern and Central states.

It is very difficult to provide an estimate of effective line-haul transportation costs for newsprint shipments. Approximately 80 per cent of all shipments from Eastern Canadian mills move by rail. On shipments from Canada to the United States, rail carriers offer three distinctly different rate structures, namely Basic Rates, Incentive Rates, and Competitive Rates. The basic rate scale applies to shipments to the Official Territory (the Northeast and North Central U.S. States) on loadings of 40,000 lbs. in 40

foot cars or 65,000 lbs. in 50 foot cars. Incentive rates, established in 1966, offer a discount of 16 to 19 per cent on the Basic rate provided that shippers load 100,000 lbs. in a 40 foot car (120,000 lbs. in a 50 foot car). Competitive rates are established on a point to point basis only in cases where there is modal competition from road or water carriers. Compared with Basic rates, competitive rates offer a discount of between 30 to 60 per cent. Since such rates are negotiated on an individual basis between the shipper and the carrier for a specific movement, the effective rate will be determined in part by the degree of inter-modal competition facing the rail carrier.

It is believed that a growing portion of total newsprint shipments from Eastern Canada to the official territory and shipments from the South to the official territory move under competitive rates.

Line haul transportation costs by rail are not strongly related to distance. Given the large number of rates and given the multitude of origin-destination pairs, it is extremely difficult to arrive at a figure for representative line haul costs. Line haul transportation costs by rail from Quebec mills to major markets on the U.S. East Coast are estimated - at X368A rate levels - to be around $40.[5] Individual producers will have transport costs per ton higher or lower than this level, depending on mill and market locations. For newsprint movements originating in Northern Ontario, average line haul charges are estimated to be $38 to $42 per ton, depending again on location of the mill and the major markets.

With respect to shipments from U.S. Southeastern mills, the effective average cost of transporting newsprint is estimated at $28 to $30.

It is highly probable that the present structure of railroad rates on newsprint effectively discriminate against Eastern Canadian mills shipping into major U.S. markets as compared with rates on shipments originating in the U.S. South. This is especially so for Quebec mills. One of the reasons for this is that southern carriers have, since 1972, been "flagging" out of *ex-parte* rate increases on South-originating

[5]X368A was the rate level prevailing in October, 1979.

traffic.[6] For example, X-349 (June 1978) imposed a 7 per cent increase on shipments from Eastern Canada to the official territory. The rate increase on shipments within the South was only 2 per cent, as was the increase on shipments from the South. The effect of flagging out can be easily demonstrated: between mid-1974 to 1979, the cumulative percentage *ex-parte* increase on newsprint traffic originating in Eastern Canada destined for the Official Territory has been approximately 81 per cent. For the same period, the cumulative increase on shipments within the South has been 27 per cent and on shipments from the South has been 30 per cent.[7] One of the reasons for the flagging out by Southern carriers is readily apparent. Southern Rail and Southern Pacific are in a better financial situation than are most Northern roads. In addition, competition from other transport modes is stronger in the South than it is in the North.[8]

Over time, it is probable that the disadvantage faced by Eastern Canadian mills in transportation costs, as compared to mills located in the U.S. Southeast, will increase since *ex-parte* rate increases are percentage increases applied to the existing rate base, and since the rate base is higher on Canadian shipments to the U.S. markets than is the case for South-originating traffic, a given percentage increase will be more onerous for Canadian than for Southern-originating movements. In addition, further flagging out by Southern carriers will exacerbate the situation.

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[6]An *ex-parte* rate increase is a joint agency tariff which provides for a general rate increase on freight movements within the U.S. and between Canada and the U.S. "Flagging" out, in this context, refers to the practice of not applying the general rate increase.

[7]In 1970 a group of 9 Eastern Canadian mills launched an appeal before both the Canadian Transport Commission and the U.S. Interstate Commerce Commission over the level of rail rates (basic and incentive rates) on newsprint exports to the U.S. The I.C.C. held that the Canadian mills had not shown that rates on movements to traditional markets were much higher than those faced by southern mills. The C.T.C., following the I.C.C. decision, rendered a similar finding. It must, however, be noted that "flagging" out has certainly altered the situation since the case was brought.

[8]It might also be argued that costs are lower in the South than the North.

Allowance must be made for transhipment costs and warehousing costs. Individual producers have reported widely differing costs for these items. Estimates have ranged from $6 to almost $15. We assume that such costs are equal to $9 a ton for Eastern Canadian producers, and $6 a ton for producers located in the U.S. southeastern states.

Summary

The estimated cost of producing newsprint in existing capacity in the various regions is shown in Table 3.6.

Table 3.6

SUMMARY OF ESTIMATED MANUFACTURING COSTS OF NEWSPRINT: EXISTING CAPACITY PER FINISHED TON

	N. Ontario	Quebec	Southeast U.S.A.
Wood Costs	85-95	68-82	52-60
Labour Costs	77-116	74-111	43-65
Energy Costs	42	36	47
Maintenance & Operating Supplies	25	25	25
Sales, Head Office, Property Taxes and General Insurance	13	13	12
Transportation Costs	47-51	49	34-36
Other Expenses (Chemicals, etc.)	10	10	10
Total (Excluding Depreciation)	$299-$352 CDN	$275-$326 CDN	$223-$255 US

- Mills located in Northern Ontario have a significantly higher variable cost of production than do mills in the U.S. Southeast. The three categories in which costs are significantly higher are wood, labour and transportation. With respect to labour costs, very little of the cost disadvantage is due to the *current* level of labour rates.[9] The bulk of the difference in labour costs is due to the

[9]Clearly, if wage rates in Eastern Canada increase at a faster rate than in the U.S. Southeast, the above statement must be amended.

very large difference in the vintage of the capital equipment between the two regions. The recently announced plans of some major producers to replace existing paper machines in Northern Ontario mills with modern high speed machines will certainly lead to a reduction in labour inputs and thus - given an assumption that wage rates in the two regions increase at the same percentage level - lead to a narrowing of the labour cost differential. At present levels of labour hourly earnings, a reduction of 3 man hours per ton for a mill currently requiring an input of 8 man hours per ton will lead to a reduction in labour costs of almost $40 per ton.

- Wood costs in Northern Ontario are, for most producers, higher than those in Quebec and, for all producers, higher than those prevailing in the U.S. southeastern states. Clearly, part of this difference is due to the fact that labour costs in logging in the U.S. Southeast are substantially lower than those prevailing in Northern Ontario.[10]

- Eastern Canadian producers face an $8 to $10 CDN disadvantage per ton in transportation costs.

THE PRODUCTION OF NEWSPRINT: NEW CAPACITY

In recent years, the technology of producing newsprint has changed rapidly in two distinct areas. The first has been the advent of high speed twin wire newsprint machines with operating speeds of the order of 3750 feet per minute. This innovation has effectively led to a large decrease in the amount of labour input required to produce a finished ton of newsprint. The second major innovation is that of the thermomechanical pulping process (TMP). In a pure TMP process, the chemical and groundwood pulps are replaced with a TMP furnish. The potential advantage of the TMP process over the traditional chemical pulp/groundwood process for providing furnish for the newsprint is twofold. First it eliminates the very heavy expenditures involved in achieving

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[10]See this chapter, page 82.

acceptable pollution emmission standards with chemical pulping facilities. Second, the yield from a TMP process is between 95 to 98 per cent compared with a yield of 60 to 70 per cent in a high yield sulphite process. In addition, the TMP process is economically viable at relatively low levels of output. Thus, in sharp contrast to chemical pulping, there do not appear to be any very important economies of scale related to plant size.

The disadvantages of a pure TMP process are two-fold. First it requires significantly greater amounts of energy to produce furnish for a ton of newsprint than does the traditional method. Second, the acceptance of a 100 per cent TMP newsprint sheet has not yet been established. Industry sources indicate that producers have not been able to sell a 100 per cent TMP newsprint sheet on the open market. Up to the present time, furnish from TMP mills has been used as a means of decreasing or "stretching" the chemical portion of the furnish.

At the present time, a significant number of producers are either in the process of constructing or designing mills to operate on a hybrid chemical-thermomechanical pulping process. This type of process, referred to as CTMP, essentially is a TMP process with the addition of a chemical sulphonation process. The advantages of CTMP over TMP are related to two areas: improved paper quality, particularly with respect to runability and lower bulk, and reductions in energy demand. The process developed by the Ontario Paper Company, for example, enables existing mills to retain their groundwood process and to produce CTMP pulp at an energy cost that is roughly comparable with that for the groundwood process (Canadian Pulp and Paper Industry, March 1980, pp. 25-26).

A considerable amount of research into TMP, CTMP and "ultra-high" yield pulping techniques is being conducted by all sectors of the industry.

The most efficient system, given the required technical properties of the furnish, is determined by a complex trade-off between wood costs, chemical costs, energy costs and environmental pollution. For example, low-yield sulphite pulp with stone groundwood provides an excellent furnish for newsprint at a relatively low energy cost, but wood costs are higher than with other methods and it requires a large investment in pollution control equipment. In contrast, high-yield sulphite uses less wood but more energy. TMP produces a much smaller amount of pollutants than do the other processes and uses less wood. TMP, however,

requires a significant amount of electrical energy and - at the present time - the addition of some chemical pulp furnish.

A high proportion of recently announced greenfield capacity is based on furnish being supplied from a TMP process. Whether or not the process will be modified to provide some CTMP furnish or whether chemical furnish will be bought on the market and added to the TMP furnish is unknown. In this context it must be noted that the quality of the TMP furnish has been improved in the last few years as the process has been modified and further developed.

Because of the rapid change in pulping technology, it is difficult to decide on whether a TMP process or a CTMP process should be chosen as the pulping technique for our study of new capacity. On balance, we have decided that for the purpose of calculating the cost of production with new capacity, a greenfield complex consisting of a single high speed newsprint machine with a rated capacity of 550 tons a day and pulp furnish being supplied from a TMP mill will be assumed. The major reason for this choice is that it does reflect the way that producers are actually intending to supply new greenfield capacity. Moreover, the difference in cost of producing newsprint from TMP, or a combination of CTMP, TMP and groundwood pulp is not extremely large.

Wood Costs

With respect to wood requirements, we assume a yield of 95 per cent from the TMP process. Given a basic density of softwood in Ontario and Quebec of 24 lbs. per cu. ft. and a density of 30 lbs. per cu. ft. in the U.S. Southeast, estimated wood costs per finished ton of newsprint are $74 to $83 in Northern Ontario, $60 to $71 in Quebec and $41 to $46 in the U.S. southeast states.

Labour Costs

A newsprint machine with a capacity of 550 tons per day, together with a TMP mill will require approximately 170 production workers on site. The estimated manpower requirement is, therefore, 2 man hours per finished ton. Salaried staff is estimated at 1 man hour per ton. The estimated labour costs are given in Table 3.7.

Table 3.7

LABOUR COSTS PER TON OF NEWSPRINT: NEW CAPACITY

	N. Ontario	Quebec	S.E. U.S.A.
Labour Inputs: Man Hours			
Production	2	2	2
Salaried	1	1	1
Labour Rates: Per Hour			
Production	$9.75 CDN	$9.33 CDN	$8.85 US
Salaried	$10.00 CDN	$10.00 CDN	$7.00 US
Fringe Benefits (Per Cent)	32	32	28
Labour Costs	$39.00 CDN	$38.00 CDN	$32.00 US

Energy Costs

The production of newsprint from a high quality TMP furnish will require a large amount of energy. Many of the earlier TMP designs required an electrical power input of 2000 to 2100 KWH to produce a ton of pulp, together with a steam requirement of 7000 lbs. Although this level has not been reduced significantly, a number of new processes have led to an *overall* decrease in the energy requirements for producing newsprint from TMP. Essentially, a process such as the Jylhä Tandem TMP recovers the heat generated from refining power as pressurized steam. Based on operations at a Finnish mill, the use of TMP steam for paper drying reduces energy costs by 20 per cent.[11]

For the purpose of calculating energy costs, total electrical power requirements are estimated at 2600 KWH per finished ton. All of the steam requirement is assumed to be generated internally. Given the present prevailing price of electrical power, the estimated cost in Northern Ontario is $52 per

[11] Hussari and Syrjänen (1980). The authors indicate that in the TMP process practically all refining power is transformed into heat. The Jylhä Tandem process enables over 80 per cent of this heat to be recovered.

finished ton of newsprint, whereas in Quebec and southeast U.S. States the respective estimates are $35 and $65.

Maintenance And Operating Supplies

Given the very limited historical experience with TMP plants, it is very difficult to obtain an accurate estimate for the cost of purchased maintenance. Based on an estimate given by an engineering consulting firm, we estimate this cost at $10 per ton. The cost of operating materials such as paper machine clothing, wrapping materials and de-foamers are estimated at $14 per ton of newsprint.

Other Operating Costs

Other operating costs are assumed to be broadly similar to those derived for existing capacity.

Capital Cost

The estimated capital cost of a greenfield operation of 550 tons per day is, in 1980, approximately $295,000 per daily ton. This implies a total capital cost of $162.25 million. Industry sources suggest that the cost would be broadly similar in Ontario and Quebec. For a location in the southeastern U.S.A., a saving of close to $14 million may be realized. Based on straight line depreciation over 20 years, the cost of depreciation per ton in Ontario and Quebec is equal to $43.50, whereas the cost for the U.S. South is $40-$50 per ton. The cost of working capital, assuming an interest rate of 15 per cent and $10 million in working capital, is $7.90 a ton.

Summary Of Estimated Manufacturing Costs

The estimated costs of manufacturing newsprint in greenfield capacity is given in Table 3.8.

The estimated operating costs of producing newsprint in greenfield capacity show that costs differ across regions in three important categories: wood costs, energy costs and transportation costs.

- With respect to wood costs, the highest cost is experienced in Northern Ontario. Northern Ontario producers can be expected to face a disadvantage of $27 to $30 CDN per ton of newsprint.

- Energy costs are lowest in Quebec and highest in the U.S. Southeast. Producers in the Southeast can be expected to pay $45 CDN more for purchased energy per finished ton than will Quebec producers and $23 CDN more per finished ton than will Northern Ontario producers.

- Producers in the Southeast U.S. will face transportation costs that are $8 to $10 CDN lower than for producers in Quebec and Ontario.

Table 3.8

COST OF MANUFACTURING NEWSPRINT: GREENFIELD CAPACITY
PER FINISHED TON

	Northern Ontario	Quebec	U.S. Southeast
Wood Cost	$74-$83	$60-$71	$41-$46
Labour Costs	39	38	32
Energy Costs	52	35	65
Maintenance & Operating Supplies	24	24	24
Sales & Head Office & Property Taxes & Insurance	13	13	12
Transportation Costs	47-51	49	34-36
Other Costs	10	10	10
Total (Excluding Depreciation)	$259-$272 CDN	$229-$240 CDN	$218-$225 US

It is to be noted that the estimated cost differentials will be sensitive to the relative regional rates of change in the price of wood, energy and transportation. Given the present exchange value for the Canadian dollar ($1 Canadian = 86.9¢ U.S.) the cost of production from Greenfield capacity in Northern Ontario and the U.S. Southeast is broadly comparable, whereas costs in Quebec would be slightly lower than costs in the U.S. Southeast and Northern Ontario.

THE PRODUCTION OF DRIED BLEACHED KRAFT PULP: EXISTING CAPACITY

In Northern Ontario, the bulk of dried bleached kraft pulp capacity is either of relatively recent vintage or, where the original mill dates back to late 1940's, has been modernized and upgraded. Existing capacity in Quebec and the Maritime provinces is, on average, older and smaller than existing capacity in Northern Ontario. Although there are mills of relatively recent vintage in these locations - such as the mills at St. Felicien and Lebel sur Quevillon - capacity is dominated by mills of relatively old vintage. With respect to mills producing dried bleached kraft pulp in the U.S. southeastern states, the data indicates that the bulk of capacity is of relatively recent vintage and of large scale.

Wood Costs

In Eastern Canada, we assume a basic density for softwood of 24 bone dry pounds per cubic foot of wood. A yield from the pulping and bleaching process of 41 to 42 per cent can be considered as representative. An air dry ton of pulp (a.d.t) contains 10 per cent moisture and 1800 lbs. of wood fibre. In consequence, an a.d.t of pulp produced in Eastern Canada will require an input of between 2.1 to 2.2 bone dry tons (b.d.t) of softwood. This implies a wood requirement of 1.75 to 1.8 cunits.

For mills located in the U.S. Southeast, a softwood basic density of 30 lbs. per cubic foot is assumed. With all fibre sourced from softwood, the wood requirement is approximately 1.45 cunits per a.d.t of pulp. If hardwoods are mixed with softwoods, as is fairly typical in the region, the total wood requirement will decline due to the higher basic density of southern hardwood (32 lb./cu. ft.) and the higher yield from pulping.

It is difficult to obtain precise information on the proportion of chips to roundwood used in supplying fibre needs. There are considerable variations in the proportion of chips to roundwood used across mills in a given region and also between regions. In Ontario, chip consumption will, on average, be lower than in Quebec and the U.S. Southeast since chip consumption is in large measure determined by the size of regional lumber capacity in relation to the output and composition of regional pulp and paper capacity.

In Northern Ontario, approximately 42 per cent of the "normal" fibre needs for kraft pulp production are met from chips, whereas in Quebec the appropriate figure is in excess of 50 per cent. In Northern Ontario, most individual mills source 50 to 60 per cent of their fibre needs from chips. There are three exceptions to this: two mills (one of very large size) are using less than 20 per cent and one mill is using marginally more than 60 per cent.[12] In the U.S. southeastern states, kraft mills typically derive 40 to 80 per cent of their fibre requirements from sawmill chips. It must be noted that chip consumption at any point in time will be dependent in part on the rate of lumber production. Estimated wood costs are given in Table 3.9.

Table 3.9

WOOD COSTS PER AIR DRY TON OF BLEACHED SOFTWOOD KRAFT PULP

	Northern Ontario	Quebec	Southeast U.S.A.
Wood Requirement (cunits)	1.75-1.8	1.75-1.8	1.4-1.5
Per Cent Chips	42	50	55
Per Cent Roundwood	58	50	45
Wood Cost	\$152-\$177 CDN	\$137-\$174 CDN	\$77-\$96 US

In each case, the low figure in Table 3.9 indicates the cost of wood for a mill procuring chips and roundwood at the lowest quoted cost for the region. The high figure is for a mill procuring chips and roundwood at the highest quoted cost for the region. The relatively wide range of wood costs shown for Quebec is, in part, due to the current large reported spread in the delivered cost of wood chips.

Labour Costs

Next to wood costs, labour costs are the second largest category of costs for existing bleached softwood kraft producers.

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[12]Based on information contained in Post's 1980 Directory and on information supplied by industry sources.

Labour requirements per a.d.t of pulp will be strongly influenced by the age and size of the mill. In general, there are economies of scale with respect to labour inputs up to an output of around 1000 a.d.t per day. A mill of recent vintage producing a 1000 a.d.t per day has a labour requirement for production labour of about 2 man hours per ton. A mill of older vintage with a capacity of 400 a.d.t per day may require as much labour input as 6 to 7 man hours per ton. Since each region has mills at both ends of the labour input spectrum, the labour costs derived below refer to what we believe to be representative for the bulk of capacity in each region. Clearly, mills that are smaller and older than is typical of regional capacity will have labour costs higher than those derived here. Conversely, mills that are newer - and larger - than is typical of regional capacity will have lower costs for labour.

Table 3.10

LABOUR COSTS IN EXISTING SOFTWOOD BLEACHED KRAFT MILLS

	Northern Ontario	Quebec	Southeast U.S.A.
Production Labour:			
Rate Per Hour	\$9.75	\$9.33	\$8.85
Labour Input (Man Hours)	3-5	3-5½	2½-3½
Salaried Staff:			
Rate Per Hour	\$10	\$10	\$7
Man Hours	1	1	1
Fringe Benefits (Per Cent)	32	32	28
Total/a.d.t.	\$52-\$77 CDN	\$50-\$81 CDN	\$37-\$48 US

Energy Costs

Energy costs in kraft pulping are not a major element of total production costs. The recent rapid increase in the price of purchased energy has led the pulp and paper industry

in both Canada and the United States to decrease its reliance on purchased energy.[13]

Steam Requirement

The steam requirement for an a.d.t of softwood bleached kraft pulp in existing North American mills is between 19,000 to 21,000 lbs. This is considerably higher than that reported by Pöyry (1978) for Scandinavian mills (under 15,000 lbs. per a.d.t). North American mills using the D_CEDED bleaching sequence, in comparison with the more conventional CEDED sequence, will have a reduction in the steam requirement of approximately 3,000 lbs. per a.d.t.

Existing mills can be expected to generate 62 to 65 per cent of the required steam from burning the black liquor solids in the recovery boiler. In addition, wood refuse such as bark and chip screen rejects can be used to provide a portion of the steam requirements. It is clear that mills sourcing their fibre supply predominantly from roundwood as opposed to sawmill chips will have a larger supply of hogged fuel compared with mills using a high proportion of chips to roundwood. Within the range of chips to roundwood proportions assumed in this section, approximately 15 to 25 per cent of the required steam can be obtained from burning hogged fuel. Clearly, pulp mills integrated with lumber production, or adjacent to lumber production, will be able to generate more steam from hogged fuel than that indicated above. The steam balance requirement is of the order of 10 to 23 per cent of the total steam requirement.

The source of purchased energy will vary by mill location. In Northern Ontario, mills can generate steam from natural gas and coal. For many mills in Quebec, the alternatives are coal and heavy fuel oil. For mills in the southeast U.S.A., much of the steam balance is sourced from oil and natural gas, with a few mills using coal.

Lime Kiln

It is estimated that the lime kiln will require 2.2 million B.T.U.'s per a.d.t of pulp. An oil fired kiln will use

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[13] Paavila (1980) estimates that between 1972 and 1978, the Canadian pulp and paper industry reduced the use of purchased energy by 12.5 per cent per ton of finished product. The reduction for bleached kraft was estimated at 17.5 per cent.

approximately 12.2 gallons of bunker "c" fuel and a gas fired kiln 2.1 Mcf per a.d.t. Given the existing structure of oil and natural gas prices, mills in Northern Ontario are at a slight advantage compared with Quebec mills, and at a relatively greater advantage as compared with U.S. southeastern mills.

Power

It is estimated that the power requirement per a.d.t of pulp is 700 KWH. Clearly, a large proportion of this can be generated by turbines running on process steam. Almost all the cost of generating electrical power from process steam falls on the capital cost side. As the price of electrical power increases, it is to be anticipated that mills will attempt to generate more power from process steam.

At the present time, the majority of mills in Eastern Canada generate 40 to 60 per cent of their power requirements internally. The proportion is generally higher than this for mills in the U.S. Southeast.

Total costs for energy per a.d.t of pulp are given in Table 3.11. It is believed that there is considerable potential for implementing energy consumption reducing measures.

Table 3.11

ENERGY COSTS FOR EXISTING BLEACHED KRAFT PRODUCTION: PER A.D.T.

	Northern Ontario	Quebec	Southeast U.S.A.
Fuel Cost	\$16-\$20	\$18-\$26	\$16-\$22
Power Cost	\$6-\$8	\$4-\$6	\$5-\$7
Total Energy Cost	\$22-\$28 CDN	\$22-\$32 CDN	\$21-\$29 US

Chemical Costs

The cost of chemicals needed to produce an a.d.t of bleached kraft pulp is a major element of total production cost. The

cost of chemicals will be determined by three basic factors: the type of bleaching process chosen, the location of the mill with respect to the point of production of the major chemicals being used, and the type of fibre being pulped.

Detailed calculations on chemical requirements for a number of different bleaching processes, together with cost estimates, are given in Appendix 3-A. For Northern Ontario mills using a conventional bleaching sequence, the estimated cost for cooking and bleaching chemicals will be in the range of $35-$45, depending on location and the type of generator used for producing chlorine dioxide. Mills using D_CEDED technology will experience slightly higher chemical costs, but this will be compensated for by a considerable reduction in the amount of steam required to produce an a.d.t of pulp.

The delivered cost of the major chemicals (caustic, chlorine and sodium chlorate) varies considerably across locations. It is estimated that for mills in Quebec, chemical costs will be in the range of $32 to $40 per a.d.t of pulp. For producers located in the southeastern U.S.A., the estimated cost of chemicals per a.d.t of pulp is in the range of $30 to $36.

Maintenance And Operating Supplies

Operating supplies, including wrapping materials, are estimated to cost $6 a ton. With respect to the purchase of maintenance materials, these are estimated at $15 per a.d.t of pulp. Differences in these costs across regions appear to be negligible.

Sales and Head Office Expenses

Sales and Head Office expenses are very difficult to estimate since they vary with the type of organization and market conditions. Head Office expenses are estimated to cost $4 per a.d.t, whereas selling costs are estimated at $11 per ton. There do not appear to be any large differences in these costs across regions.

Property Taxes And Insurance

Property taxes and general insurance costs vary across mills. Our best estimate is that such costs amount to $6 per a.d.t. Again, no significant differences across regions could be detected.

Transportation Costs

It is more difficult to estimate transportation costs for dried pulp than it is for newsprint, primarily because of the greater diversity of market points for kraft pulp. For a mill located in Northern Ontario, average line haul costs by rail to major North American market points will be in the region of $27 to $35 an a.d.t of pulp. Producers located in Quebec not only ship dried pulp to export markets in the U.S. Northeast, U.S. Midwest, and U.S. South, but also to European points. It is therefore difficult to determine an appropriate "effective" transportation cost per ton. Industry sources, together with available literature, indicate that average transportation costs would be in the order of $35 to $40. Producers located in the U.S. South sell considerable volumes of pulp within the South and export pulp to the U.S. Northeast and Midwest as well as offshore markets. Average transport costs will be in the range of $32 to $35. However, the transportation cost into markets traditionally served by Eastern Canadian producers will be lower than this. To all of the above approximately $7 must be added for transhipment and warehousing charges.

Summary Of Estimated Manufacturing Costs

Table 3.12 presents summary information on the cost of producing softwood bleached dried kraft pulp in existing capacity. It must be noted that in the labour cost estimates, only producers that are broadly representative of regional capacity have been included. In Northern Ontario and Quebec, there are some mills for which labour costs will be in excess of those indicated in Table 3.12 and some mills that will have lower labour costs than those indicated in this table. In addition, some mills in Northern Ontario and Quebec sourcing a high proportion of their wood fibre from independent contractors will have lower wood costs than the $152 given in Table 3.12.

- It is believed that the majority of firms in Northern Ontario have manufacturing costs (excluding depreciation but including transportation costs) in the range of $360 to $390.

- For Quebec producers, the comparable range would be $350 to $390.

- The majority of producers located in the U.S. Southeast would have manufacturing costs in the range of $300 to $330 CDN.

Table 3.12

COST OF MANUFACTURING SOFTWOOD BLEACHED DRIED KRAFT PULP, EXISTING CAPACITY: PER AIR DRY TON

	Northern Ontario	Quebec	Southeast U.S.A.
Wood Costs	\$152-\$177	\$137-\$174	\$77-\$96
Labour Costs	52-77	50-81	37-48
Energy Costs	22-28	22-32	21-29
Chemical Costs	35-45	32-40	30-36
Maintenance & Operating Supplies	21	21	21
Sales & Head Office Expenses, Property Taxes & Insurance	21	21	21
Transportation Costs	34-42	42-47	39-42
Total: Excluding Depreciation	\$337-\$411 CDN	\$325-\$416 CDN	\$246-\$293 US

The biggest disadvantage faced by Northern Ontario producers of bleached dried kraft pulp (and to a slightly lesser extent Quebec producers) is, compared with producers in the U.S. Southeast, the high cost of wood. On average, wood costs per air dry ton of pulp are \$60 to \$65 CDN higher in Northern Ontario than in the U.S. Southeast.

It was shown in Chapter 1 (Table 1.4) that the production of bleached softwood kraft pulp in British Columbia effectively dominates Canadian output. The reason for this dominance is that British Columbia interior producers (and until recently British Columbia Coastal producers) have a very large current cost advantage in the production of bleached softwood kraft pulp. Confidential estimates made available for this study indicate that - excluding depreciation and transportation charges - the current cost of production for the British Columbia interior mills is around \$245 a ton. Estimated transportation costs would increase this to approximately \$290 to \$295 an air dry ton. The reason for the low level of production cost is largely related to the price of wood chips. Prior to April 1, 1980, the price for wood chips in the interior had a floor price of 9 per cent of the selling price of kraft pulp. In February, the price paid by the 9 interior pulp mills was \$32.50 per unit (equal

to 2400 lb. of bone dry chips).[14] As of April, 1980, the floor price has been removed and pulp mills have been granted first refusal on buying chips in their harvesting area at the price agreed to by "others". However, only interior mills may bid for chips. (Chips surplus to the requirement of interior mills are currently being exported to Japan at a price of $100 per unit). The current chip price is around $30 to $32.50 a unit f.o.b. the sawmill.[15] B.C. coastal mills are reported to be paying between $85 to $90 a unit for chips. In 1978, when the price of chips was regulated in British Columbia as a whole, the cost of wood for both coastal and interior mills was between $29 to $30 per bone dry ton. In consequence, coastal and interior mills had a large cost advantage over producers located in other parts of Canada. Because chip prices for the coastal region were effectively deregulated in 1979, fibre costs for coastal mills have increased dramatically.

THE PRODUCTION OF DRIED BLEACHED KRAFT PULP: NEW CAPACITY

We assume a greenfield mill with a capacity of 1000 a.d.t of pulp per day.

Wood Costs

It is difficult to provide estimates of wood costs for greenfield capacity in Northern Ontario once it is recognized that Ontario's sustained fibre supply situation will not support an optimum-sized (1000 a.d.t per day) mill (see Chapter 5). We assume, however, that wood costs in the various regions are the same as those given for existing capacity. This assumption is made *only* to facilitate inter-regional manufacturing cost comparisons *if regional wood supplies are sufficiently elastic to support new capacity*. As Chapter 5 will stress, this latter condition will not be met for additional world-scale kraft capacity in Northern Ontario.

Labour Costs

With respect to production labour, the coefficients reported for recently opened mills suggest a requirement of 1.9 man hours per a.d.t. In addition, account must be taken of on-site salaried staff. For a typical mill, we assume an input

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[14]See P. Pearse (1976).

[15]Sigurdson (1980).

of 1 man hour per a.d.t of pulp. Based on labour rates and fringe benefits derived in the earlier part of this chapter, the estimated labour costs per a.d.t for greenfield capacity are $38 in Northern Ontario, $37 in Quebec and $31 in the U.S. southern states.

Energy Costs

Steam Requirement

For a new mill, the steam requirement is generally considered to be in the range of 16,000 to 18,000 lbs. per a.d.t of pulp. Sixty-five per cent of this can be generated from burning the black liquor solids in the recovery boiler. Without the addition of adjacent lumber capacity, 20 to 30 per cent of the required steam can be obtained from burning hogged fuel. The presence of adjacent lumber capacity would increase this percentage. In general, it is estimated that a maximum of 15 per cent of the steam requirement must be sourced from purchased fuel.

A high proportion of the electrical power requirement can be met by turbines running on process steam. For example, the average existing Scandinavian mill produces 90 per cent of electrical needs in this manner (Poyry 1978). The recently opened Alabama River Mill generates all of its electrical power requirement from process steam.[16]

The cost of generating electrical power from process steam falls almost exclusively on the capital cost side. We assume that the mill will purchase a maximum of 50 KWH per ton of pulp.

The estimated cost for energy, including the cost of firing the lime kiln, will be approximately $15 per a.d.t in Northern Ontario, $17 in Quebec and $20 in the U.S. Southeast.

Other Operating Costs

The cost for chemicals, property taxes and general insurance, sales and head office expenses, maintenance and operating

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[16] A discussion of the technical coefficients related to the Alabama River Mill is given in *Paper Trade Journal*, May 30, 1979.

supplies and transportation costs can be expected to be broadly similar to those derived for existing capacity.

Capital Cost

It is estimated that the capital cost for a 1000 a.d.t per day kraft mill in an Ontario location would, in 1980 dollars, be $320 million. Included in this estimate is an allowance for working capital of $20 million. The available information indicates that capital costs will not vary greatly between Ontario and Quebec. With respect to the relative cost of construction between Canada and the U.S. southern states, Landegger (1980) indicates that there are offsetting advantages and disadvantages. He notes that U.S. pollution standards are considerably more stringent than Canadian standards, necessitating an additional capital cost in the U.S. of $10 to $15 million. In Canada, the lime kiln and digester buildings must be enclosed because of inclement weather, whereas in the southern U.S. states this does not have to be done. However, most construction activity in the U.S. South is undertaken by non-union contractors, and hence labour costs involved in construction activity will be lower than would be the case in Canada. In addition, the construction season in the U.S. South is longer than it is in Eastern Canada. For these reasons, capital cost in the U.S. South may be marginally lower than would be the case in Ontario and Quebec. We therefore assume capital costs of $310 for the U.S. South. Assuming straight line depreciation over a twenty year period and an annual operating period of 345 days, depreciation costs are equal to $43.50 in Eastern Canada and $42 in the U.S. South. The cost of working capital per ton, assuming a 15 per cent interest rate, is equal to $8.69.

Summary Of Estimated Manufacturing Costs

The cost of manufacturing softwood bleached dried kraft pulp is summarized in Table 3.13.

Most locations in Northern Ontario will experience higher production costs than would be faced in Quebec and the U.S. Southeast states. With greenfield capacity, a location in the U.S. Southeast offers a large saving in wood costs per a.d.t of pulp compared with locations in Ontario and Quebec. The majority of other costs are, however, broadly comparable.

Table 3.13

COST OF MANUFACTURING SOFTWOOD BLEACHED DRIED KRAFT PULP:
NEW CAPACITY PER AIR DRY TON

	Northern Ontario	Quebec	U.S. Southeast
Wood Costs	\$152-\$177	\$137-\$174	\$77-\$96
Labour Costs	38	37	31
Energy Costs	15	17	20
Chemical Costs	35-45	32-40	30-36
Maintenance & Operating Supplies	21	21	21
Sales & Head Office Expenses, Property Taxes & Insurance	21	21	21
Transportation Costs	34-42	42-47	39-42
Depreciation & Working Capital	52	51	51
Total (Excluding Depreciation)	\$316-\$359CDN	\$307-\$357CDN	\$239-\$267US

LUMBER MANUFACTURING COSTS: EXISTING CAPACITY

In Northern Ontario, sawmills range in size from those of very small scale, designed to serve local markets, to large scale mills (in the range of 60 to 100 million board feet of lumber per year) shipping output to major Eastern Canadian markets and markets in the U.S. midwestern states. There is no accepted definition of capacity. The capacity figures referred to in this section rely very heavily on producer estimates. In general, capacity has been defined as total production when all lines are operating at 2 shifts per day, 5 days a week. (See Chapter 2.)

In order to aid in the determination of accurate lumber manufacturing costs, a large number of regional lumber producers were asked to provide specific cost information. (A copy of the survey form is contained in Appendix 3-B.) In addition, a number of producers were interviewed in person.

Wood Costs

The laid down cost of wood at the sawmill varies considerably across individual mills. The two major reasons for deviations in wood costs are due to the organization of the cutting operation and the distance that the wood is transported from the

cutting site to the sawmill. With respect to the former, sawmill operators indicated that cutting by company organized unionized crews is more costly than sourcing wood from independent contractors. Wood sourced from independent contractors was in the region of $15 to $20 cheaper per cunit than wood sourced from company cutting operations. With respect to transportation costs, the cost of hauling wood 50 miles from the cutting site to the sawmill would cost producers $11 to $12 a cunit. A transportation haul of 150 miles would lead to a cost of $29 to $30 per cunit.

The laid down cost of wood at regional sawmills is reported to vary between a low of $70 to a high of $90 per cunit. The amount of wood required to produce a thousand board feet of lumber (Mfbm) will vary from mill to mill depending on the type of equipment in the mill and the size of sawlogs. Sawmills able to obtain good quality large diameter sawlogs will require a lower wood input than will mills using small diameter logs. The "standard" conversion used for sawmills in Northern Ontario (see Chapter 4, page 138) is that 2 cunits of wood will yield a thousand board feet of lumber and 1.1 cunits of sawmill chips.

The "average" wood cost in the region for producing an Mfbm of lumber varied with the size of the sawmill. Mills producing over 50 million board feet a year reported an average wood cost of $150 to $160 per thousand board feet. Mills producing only 18 to 20 million board feet a year reported average wood costs of $160 to $165 per thousand board feet.

It should be noted that wood costs do vary considerably across different locations in Northern Ontario. In the Hearst-Chapleau area, wood costs for mills producing over 50 million board feet a year were in the range of $150 to $160 per thousand board feet, whereas comparable mills located in the Northwestern part of the region, in and around latitude 50°, reported wood costs of $145 to $150 per thousand board feet.

Almost all mills receive significant revenue from selling wood chips to area pulp and paper mills. The average amount received for wood chips was equal to $70 to $75 per thousand board feet of lumber produced. This can either be considered as revenue or as a credit to be set against wood cost.

Labour Cost

The cost of labour in the production of lumber is, next to wood costs, the second most important component of total

production cost. The required labour inputs will clearly be dependent on the type and size of productive capacity. For example, a modern mill with an annual capacity of 100 million board feet, producing studs (2"x 4"x 8') will require less labour input per thousand board feet than will a mill producing dimensional lumber. It is also apparent that mills working at full capacity will use less labour per thousand board feet than will mills producing at a rate lower than capacity. F.L.C. Reed (1980) notes that lumber production per shift will increase as the average log diameter increases while operating costs per shift are constant. Thus, mills using large diameter logs will have lower labour costs per thousand board feet than will mills using smaller diameter logs.

Based on information supplied by regional producers, it is estimated that labour inputs are equal to 3.6 to 3.8 man hours per thousand board feet for mills producing over 50 million board feet a year. For mills producing in the 18 to 20 million board feet a year range, labour input requirements were in the range of 4 to 4.2 man hours per thousand board feet. The current average labour rate per hour is $8.50. Fringe benefits and other payroll additives are estimated to increase this by 30%. Sawmills in the Hearst-Chapleau area reported the cost of production labour - including maintenance labour - as being equal to $40 to $50 per thousand board feet. The average for mills across the Northern Ontario region was between $41 to $43 per thousand board feet for mills producing 60 to 70 million board feet a year. The average labour cost for mills in the 18 to 20 million board feet a year range was between $43 to $46 per thousand board feet.[17]

Energy Costs

Energy costs are a very minor element of the total cost of producing lumber. The cost for electrical power in regional sawmills is approximately $4 to $6 per thousand board feet. The cost of purchased fuel ranged between $2 to $6 per thousand board feet. The majority of mills source the heat needed for the operation of the dry kiln from burning wood refuse.

Total energy costs for mills producing over 50 million board feet a year averaged $8 to $10 per thousand board feet. Energy costs for mills in the Hearst-Chapleau region were reported as being in the $5 to $6 range.

[17] Labour costs can be broken down into the following: sawmill operations 40 per cent, planing mill operations 20 per cent, yard operations 20 per cent, kiln operations 20 per cent and miscellaneous 10 per cent.

Maintenance And Operating Supplies, Selling And Administrative Costs

The purchase of maintenance and operating supplies is estimated to be equal to $8 to $10 per thousand board feet.

The cost of salaried staff varies considerably from mill to mill. Most producers, however, reported these costs to be in the range of $24 to $26 per thousand board feet. Selling costs varied between $2 to $5 per thousand board feet.

Property Taxes And Insurance

Almost all mills reported the cost of property tax and insurance to be between $1 to $2 per thousand board feet. The exception was that mills located in the northwestern portion of the region, near latitude 50°, reported costs of between 50¢ and $1 per thousand board feet.

Transportation Costs

The cost of transporting lumber from the mill to wholesalers in various markets is a significant part of total production costs. Transportation costs vary from mill to mill depending on the location of the mill and the destination of the output.

The majority of the output in the Hearst area is shipped to markets in the Toronto and Detroit regions. The cost to the producers for this movement is reported to be in the range of $25 to $30 per thousand board feet. Producers located in the Thunder Bay area send a large proportion of output to markets in the Chicago and Minneapolis regions. The estimated transportation cost is $37 to $38 per thousand board feet. Production from sawmills in the Longlac-Terrace Bay area is shipped in considerable volumes to markets in Michigan at a cost of $34 to $36 per thousand board feet. Finally, output from mills in the western area of Northern Ontario ship lumber into the Chicago and Minneapolis markets at an estimated transportation cost of $45 to $47 per thousand board feet.

Summary Of Manufacturing Costs

Table 3.14 presents summary information on the cost of manufacturing lumber in Northern Ontario. It can be seen that

mills producing in the range of 60 to 70 million board feet a year have a clear cost advantage over mills producing in the 18 to 20 million board feet range.[18]

- For mills producing 60-70 million board feet a year, located in the Hearst-Chapleau region, the cost of production (excluding depreciation) plus transportation will equal \$193 to \$208 per thousand board feet.

- For mills of similar size in the Thunder Bay area, the comparable range of costs is \$203 to \$218, whereas for mills located in the extreme northwestern portion of the region the cost will be \$207 to \$217.

Table 3.14

LUMBER MANUFACTURING COSTS: PER THOUSAND BOARD FEET

	Mill Size	
	18-20 MMFbM*	60-70 MMFbM
Wood Costs	\$160-\$165	\$150-\$160
Production Labour	43-46	41-43
Energy	10-12	9-11
Maintenance & Operating Supplies	10-12	8-10
Administration and Selling	32-38	27-30
Property Taxes & Insurance	1-2	1-2
Chip Credit	70-75	70-75
Total Before Transportation & Depreciation	\$186-\$205	\$166-\$181

*An MMFbM is a million board feet of lumber.

The cost of producing lumber is extremely sensitive to net wood costs (equal to wood costs minus the sale of chips). For example, a 10 per cent increase in wood costs, coupled with a 10 per cent decline in chip prices would lead net wood costs to increase by \$22.75 per thousand board feet. Thus, the cost of manufacturing lumber in given locations will be largely determined by the net cost of wood and the cost of transporting lumber to major markets. Most of the

[18] In general, costs per thousand board feet decrease as capacity increases from 18 million to 60 or 70 million board feet a year.

differences in the cost of producing a specific lumber product across regions will be due to differences in net wood costs and to differences in transporting the product to major markets.

LUMBER MANUFACTURING COSTS: NEW CAPACITY

With respect to the production of lumber from new capacity. We have chosen to look at three very different sizes of operations: a sawmill with a capacity of 5 million board feet a year, a mill in the 18 to 20 million board feet a year range, and finally, a large mill with a capacity of 60 to 70 million board feet a year.

The two larger mills can be expected to have operating costs that are only marginally different to operating costs in existing capacity, depending, of course, on the specific location of the mill. With regard to the mill with a capacity of 5 million board feet, we have been unable to obtain any precise estimates on unit operation costs. However, the general indication is that a mill of this size would have unit operating costs in excess of those given for the 18 to 20 million board feet a year mill. As such, the very small mill could only be a viable proposition in the long run if it was designed to serve a local market that was located a considerable distance from any other potential supplier. That is, high transportation costs serve as a barrier to other mills with lower production costs from shipping into the specific market.

For the purpose of calculating capital costs, we assume that the new capacity will be located between latitude 50^{o} and 51^{o} between Sioux Lookout and Hearst. Production will be 60 to 70 per cent kiln-dried studs and 40 to 30 per cent random lengths (2"x 4"x 8' - 20'). It is further assumed that the sawmill will not be integrated with a pulp and paper plant.

Specific cost information on new capacity was obtained directly from a number of existing regional producers and equipment suppliers. Summary costs are given in Table 3.15.[19]

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[19] It must, of course, be noted that capital costs will vary across locations.

Table 3.15

COST OF GREENFIELD LUMBER CAPACITY: (MILLIONS OF DOLLARS)

	Sawmill Capacity		
	5 MMFBM	18-20 MMFBM	60-70 MMFBM
Plant Costs			
Site Preparation (Including Rail Spur, if Needed)	.38-.4	.8-.85	1.4-1.5
Foundations & Footings	.08-.1	.45-.5	.9-1.0
Buildings & Services	.38-.4	.6-.7	1.75-1.85
Equipment Costs			
Yard Equipment	.45-.5	.75-.8	1.5-1.6
Sawmill Equipment (Including Log Sorter)	.9-1.0	2.1-2.35	6.6-6.7
Kilns & Planing Mill	.6-.65	1.7-1.75	3.4-3.5
Miscellaneous Equipment (Chip Equipment, etc.)		.5-.55	2.1-2.3
Miscellaneous	.22-.25	.35-.4	.8-1.0
Total	3.0-3.3	7.35-7.9	18.35-19.5

Table 3.15 reveals significant economies of scale in the construction of new capacity. For a mill of 5 million board feet a year capacity, capital costs are equal to $630 per thousand board feet, whereas for a mill in the 18 to 20 million board feet a year range, the capital cost is equal to approximately $400. For a mill in the 60 to 70 million board feet capacity range, the appropriate figure is between $270 to $315 per thousand board feet. Thus, the capital outlay required for the small mill per thousand board feet is more than double that required for the large mill. For the 18 to 20 million board feet mill, the capital outlay per thousand board feet is 1.36 of the outlay required for the large mill.

Industry sources have indicated that capital costs will be higher for sawmill locations north of latitude 50° compared with locations in existing large to medium size communities. The major reasons for this are the added cost of transporting

equipment and materials to the site, the lack of support facilities and ready availability of construction trades, weather restrictions and general isolation costs.

The capital costs for 18 to 20 and 60 to 70 million board feet mills are substantially above those which would arise if the sawmill was integrated into a pulp or paper mill. For an 18 to 20 million board feet mill, the capital cost for the sawmill integrated into a pulp or paper complex would be around $5 million as opposed to the $7.35 to $7.9 million estimated cost given above. For a 60 to 70 million board feet mill, the estimated cost would be approximately $15 million as opposed to the $18.35 million to $19.5 million estimated for an independent mill.

COMPARISON OF LUMBER MANUFACTURING COSTS IN OTHER REGIONS

Any comparison of the cost of producing lumber across regions is fraught with a large number of difficulties. First, as opposed to newsprint and dried bleached softwood kraft pulp, lumber is not a homogeneous product. The cost of producing studs, for example, will not be comparable with the cost of producing dimensional lumber or boards. Mills in different regions specialize in producing given types of lumber. British Columbia coastal mills produce mainly boards and dimensional lumber, whereas interior producers mainly manufacture studs. Mills in the U.S. Southeast produce a mixture of studs and dimensional lumber whereas the bulk of production in Northern Ontario is studs. Second, because lumber is not homogeneous, price depends on the type of lumber being produced. Third, lumber markets are not as well integrated as are markets for newsprint and kraft and in consequence tend to be more regionalized. (See Chapter 2.)

Because of the above considerations, any comparison of the cost of manufacturing lumber in different regions must be treated with considerable caution. From the perspective of producers located in Northern Ontario, what is important is the ability to compete in a relatively well defined set of markets (the Toronto, Detroit, Chicago and Minneapolis regions) for studs and some random lengths. Geographical proximity of production points to markets is far more important for lumber production than it is for newsprint or kraft pulp. For Northern Ontario producers, transportation costs increase the effective cost of production by 14 to 25 per cent, depending on mill and market location.

In lumber manufacturing in Northern Ontario, there is not a large spread in costs between high and low cost producers. Sandwell (1977) while finding a similar result for Northern Ontario, indicates that the spread of costs between high and low cost producers in other regions, especially in Northern Quebec and the U.S. Southeast, is quite large. Using 1976 data, Sandwell reports average (weighted) production costs of $141 per Mfbm in the U.S. Southeast, $166 per Mfbm in Northern Quebec, $180 per Mfbm in Northern Ontario and $176 per Mfbm in the British Columbia interior. These estimates include transportation and depreciation costs.

An analysis of available data indicates that there are offsetting advantages and disadvantages in production costs in the various regions.

- Because Northern Ontario producers, for the most part, have modern mills of optimal scale, labour productivity is high.[20] Thus, even though wage rates are in excess of those prevailing in Quebec and Southeast U.S. mills, labour costs per thousand board feet are roughly comparable with those in other regions, with the U.S. Southeast producers enjoying a $3 to $5 CDN advantage over Northern Ontario producers, and Northern Ontario producers in turn enjoying a similar advantage over B.C. Interior and Quebec producers.

- Northern Ontario producers face higher net wood costs than do producers in the B.C. Interior, Quebec and the U.S. Southeast. However, the recent large increase in chip prices in Northern Ontario has reduced the net wood cost disadvantage to some extent.[21]

- The higher production costs in Northern Ontario will clearly limit the ability of Northern Ontario producers to market their output over as large a geographical region as will producers located in low cost regions.

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[20]Mills serving local or specialized markets have been excluded from the analysis.

[21]Wood costs derived for Northern Ontario mills for the early part of 1980 are at the same level as those given by Sandwell (1977) for 1976. Thus, although gross wood costs have risen considerably, this increase has been compensated for by higher prices for chips.

ESTIMATES OF PRODUCTION COSTS IN U.S. DOLLARS

Table 3.16 shows production costs for newsprint and bleached softwood kraft pulp in U.S. dollars at an assumed value for the Canadian dollar of $1 Canadian = $.875 U.S.

Table 3.16

PRODUCTION COSTS PER TON: U.S. $

	Northern Ontario	Quebec	U.S. Southeast
Newsprint: Existing Capacity	$261-$308	$241-$285	$223-$255
Newsprint: New Capacity	226-238	200-210	218-225
Kraft Pulp: Existing Capacity	294-359	284-364	246-293
Kraft Pulp: New Capacity	276-314	268-312	239-267

The estimates of production costs exclude any costs for depreciation. In the case of new capacity, depreciation costs will be dealt with in detail in Chapter 5. With respect to existing capacity, depreciation charges have been omitted because they are a fixed long run cost that is very plant specific. In general, because much of the newsprint capacity in the U.S. Southeast is of relatively recent vintage whereas the bulk of capacity in Northern Ontario is of very old vintage, depreciation costs will be higher in the U.S. Southeast than in Northern Ontario (and Quebec).

The cost estimates in U.S. dollars in Table 3.16 reveal that at the assumed exchange rate of $1 Canadian = $.875 U.S., the cost of producing newsprint and kraft pulp is higher - both from new and existing capacity - in Northern Ontario than in the U.S. Southeast. Clearly, the relative cost disadvantage is sensitive to changes in the exchange rate.

With respect to lumber production, mills of optimal scale in Northern Ontario have costs in U.S. dollars of between $168 and $191, depending on the location of the mill and major shipping points. Mills of less than optimal scale will face production costs larger than those indicated above.

APPENDIX 3-A

CHEMICAL REQUIREMENTS IN SOFTWOOD BLEACHED KRAFT PULPING*

There are a number of different chemical processes which can be used in the production of bleached kraft pulp. In this analysis we concentrate on the derivation of chemical requirements for two five stage bleaching sequences: the conventional CEDED sequence and the D_CEDED sequence. The latter can be operated in either a closed cycle environment where the effluent from the bleach plant is reclaimed or in an open cycle operation.

Table 3-A.1 shows the required chemical doses for the two sequences on the assumption that the D_CEDED sequence is operated in an open cycle. It should be noted that if a closed cycle operation is undertaken, an additional 25.5 lb. of caustic will be required.

Table 3-A.1

Stage	Chemical	%	CEDED lb./Ton	%	D_CEDED 70/30 ClO_2/Cl_2 lb./Ton
1	Chlorine	6.5	130	2.25	45
	Chlorine Dioxide	-	-	2.0	40
2	Caustic Soda	3.7	74	2.5	50
3	Chlorine Dioxide	1.2	24	1.2	24
	Caustic Soda	0.4	8	0.4	8
4	Caustic Soda	0.5	10	0.5	10
5	Chlorine Dioxide	0.4	8	0.4	8
	Caustic Soda	0	0	0	0

*This Appendix was prepared by Prof. A. Gilbert, School of Engineering, Lakehead University.

The total chemical requirements for the bleach plant are given in Table 3-A.2.

Table 3-A.2

	CEDED	Lb./Ton D_cEDED (Open)	D_cEDED (Closed)
Cl_2	130	45	45
ClO_2	32	72	72
NaOH	92	68	93.5

Since chlorine dioxide (ClO_2) is a toxic and explosive gas, it cannot be transported and, therefore, must be generated in the mill. There are a number of processes for generating chlorine dioxide. The chemical requirements for the three basic processes are shown in Table 3-A.3 on the assumption of a 95% efficiency of generation for the ERCO R3 process and an 85% efficiency for the Matheson and Solvay processes. It is to be noted that most existing Northern Ontario mills use a Matheson process which leads to a reduction in the amount of sodium chlorate used and the substitution of relatively cheaper sulphur dioxide. During the recent strike by INCO, many mills - because of the non-availability of sulphur dioxide - were forced to run Matheson generators by a Solvay process using methanol.

The by-product sulphuric acid and sodium sulphate are used to supply the makeup sulphate requirement of the mill, which is of the order of 80-120 lbs. per ton of pulp. Mills using a high replacement of chlorine with chlorine dioxide make more than enough saltcake to match their requirements.

A summary of the required chemical inputs - those that must be purchased - is given in Table 3-A.4.

Table 3-A.3

	LBS./TON					
	R3 PROCESS		MATHESON		SOLVAY	
	CEDED	D_CEDED 70/30 D_C	CEDED	D_CEDED 70/30	CEDED	D_CEDED 70/30
Chemicals Required:						
Sodium Chlorate Na ClO_3	53	119.6	60	104.6	60	134.6
Sulphuric Acid H_2SO_4	54.4	122.4	69.8	157	92.8	208.8
Sodium Chloride NaCl	30.4	68.4	9	20.2	3.2	7.2
Sulphur Dioxide SO_2	-	-	19.6	44	-	-
Methanol CH_3OH	-	-	-	-	6.8	15.4
By Products:						
Sulphuric Acid H_2SO_4	-	-	54.4	122.4	54.4	122.4
Sodium Sulphate Na_2SO_4	73.6	165.6	41.6	93.6	41.6	93.6
Chlorine Cl_2	18.6	41.8	-	-	-	-
Effective Available Makeup	73.6	165.6	119.6	270	120.4	170

Table 3-A.4

SUMMARY OF CHEMICAL REQUIREMENTS

	Lbs./Ton					
	Conventional CEDED			D_cEDED (No closed cycle)		
	R3	Matheson	Solvay	R3	Matheson	Solvay
Cl_2	130	130	130	45	45	45
NaOH	92	92	68	68	68	68
H_2SO_4	54.4	69.9	92.8	122.4	157	208.8
$NaClO_3$	53	60	60	119.6	134.6	134.6
NaCl	30.4	0	0	68.4	0	0
SO_2	0	19.6	0	0	44	0
CH_3OH	0	0	6.8	0	0	154
Na_2SO_4	20-60	20-60	20-60	0	0	0
Limestone	80-120	80-120	80-120	80-120	80-120	80-120

APPENDIX 3-B

SOURCES OF DATA FOR THE LUMBER COST STUDY

In order to provide accurate estimates on the cost of producing lumber in Northern Ontario, 17 regional producers were sent the attached survey form. In addition, a large number of producers were requested to provide information in interviews.

In total, 16 regional producers provided information on production costs. Of these, 8 producers provided very detailed specific information on costs. It must be noted that all information was provided on the understanding that the raw data would be treated in confidence.

The producers in our survey have an aggregate productive capacity equal to 1 billion board feet a year. This represents approximately 60 to 70 per cent of Ontario lumber productive capacity. It must be noted that small scale producers are under represented in the sample.

ONTARIO ROYAL COMMISSION ON THE NORTHERN ENVIRONMENT
FOREST-RELATED INDUSTRIES ECONOMIC STUDY
LUMBER COST QUESTIONNAIRE

SECTION 1: IDENTIFICATION

COMPANY: ____________________

LOCATION: ____________________

POSITION OF RESPONDENT: ____________________

ANNUAL PRODUCTION IN BOARD FEET: ____________________

SECTION 2: UNIT MANUFACTURING COSTS

Please check the appropriate space. If higher or lower please specify range. Most costs (except wood) in $per Mfbm produced.

A. WOOD COSTS

Laid down costs of round wood per cord at the mill before chip credits. ($per cord).

___	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	___
Lower	60-65	65-70	70-75	75-80	80-85	85-90	90-95	95-100	100-105	105-110	Higher

B. PRODUCTION LABOUR

All hourly paid production labour (equipment operators, graders, labourers, etc.) including maintenance labour and all fringe benefits excluding all salaried staff ($per Mfbm).

___	☐	☐	☐	☐	☐	☐	☐	☐	___
Lower	30-33	33-36	36-39	39-42	42-45	45-48	48-51	51-54	Higher

C. ENERGY

C.1 All hydroelectricity ($per Mfbm).

___	☐	☐	☐	☐	☐	☐	☐	___
Lower	1-2	2-3	3-4	4-5	5-6	6-7	7-8	Higher

C.2 All other fuel (natural gas, fuel oil, etc.) ($per Mfbm).

___	☐	☐	☐	☐	☐	☐	☐	___
Lower	1-2	2-3	3-4	4-5	5-6	6-7	7-8	Higher

.. please turn over

D. MAINTENANCE AND OPERATING SUPPLIES

These supplies include lubricants for all machines (including movable equipment), replacement parts (sawmill knives, blades, etc.), other clean-up and maintenance supplies ($per Mfbm).

____ Lower ☐ 4-6 ☐ 6-8 ☐ 8-10 ☐ 10-12 ☐ 12-14 ☐ 14-16 ____ Higher

E. ADMINISTRATIVE EXPENSES

E.1 Salaried office staff includes all salaried personnel (management, engineers, accountants, clerks, etc.) except salesmen ($per Mfbm).

____ Lower ☐ 14-16 ☐ 16-18 ☐ 18-20 ☐ 20-22 ☐ 22-24 ☐ 24-26 ☐ 26-28 ☐ 28-30 ____ Higher

E.2 Sales Expenses includes all expenses directly incurred in selling the product (salesmen, promotion, etc.) ($per Mfbm)

____ Lower ☐ 1-2 ☐ 2-3 ☐ 3-4 ☐ 4-5 ☐ 5-6 ☐ 6-7 ____ Higher

F. PROPERTY TAXES AND INSURANCE

F.1 Total property taxes ($per Mfbm)

☐ 0-.5 ☐ .5-1 ☐ 1-2 ☐ 2-3 ☐ 3-4 ____ Higher

F.2 Total insurance costs on all buildings and equipment in the sawmill complex. ($per Mfbm)

☐ 0-.5 ☐ .5-1 ☐ 1-2 ☐ 2-3 ☐ 3-4 ____ Higher

G. DEPRECIATION CHARGES

Depreciation charge allocated each year to all buildings and equipment. ($per Mfbm)

____ Lower ☐ 3-5 ☐ 5-8 ☐ 8-11 ☐ 11-14 ☐ 14-17 ☐ 17-20 ☐ 20-23 ☐ 23-26 ____ Higher

H. INTEREST CHARGE

Interest charges paid ($/Mfbm).

___ Lower ☐ 2-3 ☐ 3-4 ☐ 4-5 ☐ 5-6 ☐ 6-7 ☐ 7-8 ___ Higher

I. TRANSPORTATION COSTS

I.1 Where product shipped to:

☐ - Toronto, ☐ - Detroit, ☐ - Chicago, ☐ - Minneapolis, Other ______

I.2 Mode of Shipment - Percentage

☐ - Rail, ☐ - Truck

I.3 Cost of Shipping in Canadian Dollars ($per Mfbm)

___ Lower ☐ 20-25 ☐ 25-30 ☐ 30-35 ☐ 35-40 ☐ 40-45 ☐ 45-50 ☐ 50-55 ___ Higher

....

SECTION 3: CAPITAL COSTS

The study group is attempting to determine the capital costs of existing capacity of sawmills. These capital costs include costs of plant and equipment. Please fill in the information below.

A. BUILDINGS - including foundation, buildings and all services.

	Type	Square Footage	Cost	Date
example:	Sawmill	20,000	$500,000	1975

.. please turn over

B. EQUIPMENT

B.1 YARD EQUIPMENT - including lumber-handling, log-handling, yard maintenance equipment etc. (Estimate if Lease or Rental).

	Type	Number	Individual Cost	Date
example:	fork-lifts	3	$100,000	1977

B.2 SAWMILL EQUIPMENT - including log sorter, saw lines, chippers, edgers, stackers, conveyors, dry kilns, planers, trimmers, chip blowers, etc.

	Type	Number	Individual Installed Cost	Date
example:	Mark II Chip 'n Saw	1	$500,000	1976

SECTION 4: COMMENTS

Please make any comments you feel might be helpful to this study.

THANK YOU

CHAPTER 4

WOOD SUPPLIES IN NORTHERN ONTARIO

THE METHODOLOGY OF ALLOWABLE CUTS

Previous chapters have examined capacity developments in the Ontario newsprint, kraft pulp and lumber industries, their relative competitive positions in North America, and the destinations and pricing patterns characteristic of these sectors; but the very existence of forest industries depends upon the availability of an annual flow of wood fibre from the natural resource base. The present chapter examines Northern Ontario's wood supplies in relation to the demand for wood fibre exerted by the existing level of capacity in the province.

Planned supply from a natural resource stock depends upon the application of rational principles of inter-temporal allocation to the existing stock of the resource together with knowledge of the growth properties of the stock. Though many economists disagree with the theory, forest management has crystallized around the concept of *maximum sustained yield:* the view that correct management requires the largest possible harvest volume consistent with the indefinite continuation of that harvest volume. It is this approach that determines supply in Ontario and takes the form of the annual allowable cut (AAC) calculations by the Ministry of Natural Resources, Forest Resources Group.* Implicit in the AAC calculation as a sustained yield concept is the quality regeneration of the forest following harvesting.

Maximum sustained yield strongly influences the choice of growing periods (rotations) for tree species in the forestry literature. Maximizing the harvest volume requires cutting when the annual average increment to wood volume is largest, and this occurs when mean annual increment of volume (MAI) equals the current annual increment (CAI). In Ontario, silvicultural and product considerations lead to somewhat longer growing periods. The resulting rotations are shown in Table 4.1. The predominance of spruce in the forest means that 100 years is a workable benchmark for Ontario's 'average' rotation period.

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*Formerly the Division of Forests

Table 4.1

ROTATION PERIODS-ONTARIO SPECIES*
(YEARS)

	Sawlogs/Peeler Logs	Pulpwood
Jackpine	70-80	60-70
White pine	100-120	90
Red pine	50-60	50-60
Black spruce	-	100-110
Tolerant hardwoods	120	-
Poplar	-	60
White Birch	-	70

Source: Nautiyal (1977)

*Rotation periods can vary by management unit.

Allowable cuts for a 20 year planning period are determined for different 'working groups' dominated by a single species or group of species. The allowable cut on a simple *area basis* is 20 times the total area divided by the rotation period. The AAC is then one-twentieth of the allowable cut during the planning period. Application of the simple *area basis* ensures a 'normal' forest after one full rotation - that is, a forest consisting of even-aged stands from which a constant volume will be removed in each period.

The 'normal' forest is, however, an ideal construct. When substantial volumes of wood are present in higher age classes, it is seldom desirable to attempt to produce a 'normal' forest after one rotation. Simple area calculations are, therefore, modified. The volume of wood and its current annual increment in a 'normal' forest will usually differ from volume and increment in the forest actually encountered. When old growth timber is present - as it is in Ontario - the actual volume exceeds the volume of a 'normal' forest and maximum yield will require acceleration of removals to prevent a loss of total merchantable wood in the older age classes. Accelerated removals of wood beyond the selected rotation period proceeds by the application of calculations such as Gerhardt's Formula under which removal of fibre in over-mature areas proceeds more rapidly than strict adherence to

the area basis would imply.[1] From the perspective of maximum sustained yield, application of the volume formula to a forested area characterized by old growth trees means that an increase in *total* wood volume over the planning period is exchanged for an uneven - or unsustainable - flow of fibre. Subsequent planning periods will then involve a *decline* in the annual harvest relative to earlier planning periods as the old growth age classes are depleted.

In Ontario, softwood annual allowable cuts are expected to exhibit a 20 per cent decline by the year 2000 on long-term licences and 16 per cent on Crown Management Units, reflecting the operation of Gerhardt's formula and similar calculations in the context of old growth forests.[2] Since the twenty year planning periods for 'working groups' overlap, part of this decline will occur by 1990, with the total reduction in evidence only when the most recently re-calculated allowable cuts are once again reviewed (in the year 2000). Current allowable cuts for Crown land in Ontario total approximately 12.5 million cunits of net merchantable volume with an expected decline to about 10.4 million cunits over the next 20 years.[3] Private forest owners in Ontario are not required to manage for sustained yield. Since about 85 million acres of Crown land in Ontario are classified as productive forest land, a 100 year average rotation implies that the current AAC of 12.5 million cunits should be associated with harvesting of 860 thousand acres at full utilization of the present AAC, for a yield of 14.7 cunits per acre.[4] Yields per acre should be understood to be highly variable with sites and species and also reflect full utilization according to the

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[1]The AAC by Gerhardt's Formula is: $$\text{AAC} = \frac{\text{Actual CAI + Normal CAI}}{2} + \frac{\text{Actual Growing Stock (AGS) - Normal Growing Stock (NGS)}}{F}$$ where F is an adjustment period ranging from 10 years to half the rotation period. When AGS>NGS (old-growth forests), AAC is increased in inverse proportion to the length of the adjustment period.

[2]Reed (1980), pages ii, 8.

[3]As reported in MNR working documents, Reed (1978), Hansard (1979). Reduced by 17.5% in the year 2000.

[4]A comparison of timber harvested on Crown land and Crown acreage cutover for the six year period 1974-1979 reveals an average harvest of 11 cunits per acre (MNR *Annual Reports* and MNR *Statistics*, various). See also Armson (1979) and Waddell (1977). Armson uses a figure of 11 cubic feet per acre per year in Ontario while Waddell mentions 10.4 cubic feet per acre per year. These figures translate into 11 and 10.4 cunits per acre with a 100 year rotation period.

definition of AAC volumes. The standard of utilization assumed in calculating Ontario AAC's involves the removal of all species within specified stump heights and top diameters. This standard of utilization is seldom achieved in practice and has the effect, not only of reducing the annual supply of fibre from Ontario forests relative to the calculated AAC, but also of complicating the process of regeneration by leaving cutover land occupied by quantities of slash and unharvested standing timber.[5] The recent trend to 'full-tree harvesting' may lead to an improvement in utilization.

ALLOWABLE CUTS AND FIBRE REQUIREMENTS IN NORTHERN ONTARIO

Northern Ontario consists of the four Ministry of Natural Resources regions shown in Chart 1.1. These four regions - the Northwestern, Northern, North Central, and Northeastern - encompass 76 million acres of productive forest land (75 per cent of the Ontario total) of which 71.5 million acres are Crown forests administered by the Forest Resources Group and the remainder are private lands. Tables 4.2 and 4.3 show summary and detailed softwood (conifer) and hardwood allowable cuts associated with Crown and private productive forest in Northern Ontario as reported by Reed (1980) from Ministry of Natural Resources data. As mentioned earlier, these AAC's are expected to decline by 20-25 per cent over the next twenty years and are highly uncertain for the private lands component. The AAC's on Crown land are divided into those calculated directly by the Forest Resources Group on Crown Management Units and those calculated by the holders of Order-in-Council licences subject to the approval of the Forest Resources Group.[6] With a few exceptions, limits allocated under Order-in-Council licences are held by pulp and paper companies to provide fibre for their Ontario pulp mills. Parts of these licences are currently being converted to more comprehensive agreements covering forest management expenditures in addition to harvesting rights. From 1962 to 1980, all forest management has been the exclusive responsibility of the Ministry of Natural Resources. Henceforth, as the Forest Management Agreements (FMA's) are negotiated, the licence-holders will

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[5]Heeney (1978). The utilization question is discussed further in the next section.

[6]The *Crown Timber Act* specifies four types of licenses of which the Order-in-Council licence renewable for up to 21 year terms is the most important. Ninety-nine per cent of lands licenced for forest production in Ontario are in Order-in-Council licences which provide long-term timber supplies to their holders {*Crown Timber Act*, Government of Ontario, 1976, section 3(1)}.

assume direct responsibility for regenerating the supplies of wood fibre upon which their manufacturing facilities depend, with reimbursement and monitoring from the Ministry.[7]

Table 4.2

ANNUAL ALLOWABLE CUT (NORTHERN ONTARIO)*
(MILLIONS OF CUNITS)

	Softwood	Hardwood
Crown	7.5	3.5
Private	.3	.6
Total	7.8	4.1

Source: Reed (1980)

*Revision of the Northwestern Planning Region AAC (MNR 1977) implies a total Northern Ontario AAC of 10.9 million cunits rather than the 11.9 million figure reported here.

Order-in-Council licensees enter into what are called third-party agreements to supply sawlogs from their limits to independent sawmillers and third-parties may also be granted the right by the Ministry to cut species not required by the licensee. On Crown Management Units, cutting licences are shorter in duration and may be accompanied by volume agreements or first-refusal rights to sawlogs, chips, and pulpwood derived from the Crown forest.

An initial, but not entirely accurate, method of examining the supply of Northern Ontario wood fibre in relation to the demand for it is to confront the annual allowable cut with an estimate of 'normal' wood requirements associated with the existing forest products manufacturing sector. By a wide margin, pulpmills exert the greatest demand for fibre. Nine pulp and paper companies (Abitibi-Price Ltd., American Can of Canada Ltd., Boise-Cascade Canada Ltd., Domtar Forest Products Ltd., E.B. Eddy Forest Products Ltd., Great Lakes Forest Products Ltd., Kimberly-Clark of Canada Ltd., Ontario Paper Co. Ltd., and Spruce Falls Power and Paper Co. Ltd.) hold Order-in-Council cutting licences in Northern Ontario. In consultation with these companies and in response to their stated needs, Reed (1980) estimated that they require 5.1

[7]As recommended by Armson (1976). See Appendix 4-C of the present report for a discussion of FMA's.

Table 4.3

CURRENT ANNUAL ALLOWABLE CUTS
ON CROWN FOREST LANDS IN NORTHERN ONTARIO
(000 CUNITS)

	Pulp & Paper Long-term Licences	Crown Management Units	Total
Softwood			
Northwestern	1,252	483[1]	1,735
North Central	2,471	232	2,703
Northern	1,305	983	2,288
Northeastern	122	641	763
	5,150	2,339	7,489
Hardwood			
Northwestern	378	357	735
North Central	883	248	1,131
Northern	351	500	851
Northeastern	33	796	829
	1,645	1,901	3,546

[1]Does not include two Crown Management Units (Berens River & Lake St. Joseph) presently considered inaccessible. Softwood annual allowable cut is 509 thousand cunits for these two units.

Source: Reed (1980), as reported by the pulp and paper companies and MNR. See also note to Table 4.2.

million cunits of *softwood* fibre annually from Northern Ontario forests. Table 4.4 exhibits an independent corroboration of this result. In Table 4.4, newsprint, kraft and other chemical pulp capacities, together with groundwood pulp capacities not used for newsprint, are totalled for the nine companies to obtain an aggregate pulpwood requirement. 'Normal' operation is assumed to be 94 per cent of *Lockwood's Directory* (1980) capacity and an allowance is made for hardwood pulp to render the result comparable to Reed. Total pulpmill requirements in Northern Ontario are estimated to be 5.7 million cunits per annum, of which 5.1 million cunits are softwood fibre.

Table 4.4

ESTIMATED NORTHERN ONTARIO WOOD REQUIREMENTS
FOR PULP MILLS HOLDING ORDER-IN-COUNCIL LICENCES

	(Capacity in Short Tons Per Day)		(Conversion Factor)	(Daily Wood Needs at Capacity)
Newsprint*	5683 tpd	x	.98	5570 cunits/day
Dried kraft pulp	4685 tpd	x	1.75	8199 cunits/day
Other chemical pulp**	1470 tpd	x	1.75	2572 cunits/day
Other groundwood pulp	1010 tpd	x	.94	949 cunits/day
Total Daily Wood Requirement at Capacity				17,290 cunits/day
Total Annual Wood Requirement at Capacity				5.94 million cunits
Total Annual Wood Requirement - 'Normal' Operation				5.69 million cunits
Softwood Requirement - 'Normal' Operation				5.12 million cunits

Source: *Lockwood's Directory* (1980). Conversion factors as in Chapter 3. Capacity defined as 350 days/year. 'Normal' operating rate assumed to be 94% of capacity. Softwood requirement assumed to be 90% of total wood fibre requirement (88-90% of pulpwood used in Ontario in 1977 was softwood pulpwood - *Statistics Canada* - Pulp & Paper Mills (36-204), table 5A).

* Differs from capacity in Table 1.1 by the addition of the Ontario Paper Company capacity at Thorold.

**Slush kraft pulp plus semi-chemical pulp produced at Sturgeon Falls.

Wood requirements of the sawmilling sector, net of woodchip production, must be added to the requirements of the pulp-mills. The Reed (1980) study for the pulp and paper companies included an estimate of the softwood requirements of sawmills affiliated with pulp and paper companies together with a survey of the wood requirements of the largest 24 independent softwood sawmilling companies drawing on Northern Ontario wood supplies. The affiliated sawmills and the surveyed independents cover more than 90 per cent of the softwood lumber industry in the region.[8]

For the estimates that follow, it is assumed that each 2 cunits of roundwood processed by a typical sawmill yields one thousand board feet (1 Mbfm) of lumber plus 1.10 cunits of pulp chips. In 1978, sawmills in Northern Ontario are reported to have produced 1.26 million Mbfm of softwood lumber and .084 million Mbfm of hardwood lumber. The Reed survey of 24 independent sawmills revealed that many mills operated at less than normal rates. To compensate for this, it is assumed that normal operation in 1980 would involve production of 1.5 million Mbfm of softwood lumber and .1 million Mbfm of hardwood lumber. Given these approximations and the foregoing conversion formula, normal sawmilling requirements would consist of 3 million cunits of softwood roundwood and .2 million cunits of hardwood roundwood. The manufacture of lumber would involve production of 1.65 million cunits of softwood pulp chips and .11 million cunits of hardwood pulpchips. When these estimates are combined with the estimated softwood and hardwood requirements of pulpmills in Table 4.4, total estimated softwood and hard-wood net requirements of fibre are obtained (Table 4.5).

The relatively small use of hardwood in the furnish for pulpmills (about 10 per cent) and in lumber manufacture in Northern Ontario (about 6 per cent) means that the forest industries of the region are based essentially on softwood fibre supplies.[9] For softwood requirements, the estimates in Table 4.5 leading to a net requirement of 6.47 million cunits of fibre annually are in close agreement with the Reed estimates (6.28 million cunits of softwood fibre

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[8]Reed (1980), 16.

[9]A higher proportion of hardwood lumber (about 15 per cent) characterizes the province as a whole owing to the relative prominence of maple and yellow birch in Southern Ontario forests. For lumber production by species see: *Sawmills & Planing Mills* (Statistics Canada 35-204), table 6A.

required annually).[10] Neither the estimates reported here nor those reported by Reed for the pulp and paper companies include fibre requirements of veneer and plywood and miscellaneous wood-using operations. Apparently, most veneer and plywood operations in Ontario use hardwoods (Reed 1980, 10) and in Northern Ontario the major hardwood species are poplar and birch. For Canada as a whole, veneer and plywood mills consumed .09 million cunits of these two species in 1978, so the adjustment for net hardwood fibre requirements in Northern Ontario from this source would be quite small.[11] Miscellaneous wood industries in Canada consumed .22 million cunits of softwood fibre and .4 million cunits of hardwood fibre in 1977.[12] Again, the Northern Ontario share of these totals would be too small to warrant other than marginal adjustments to the estimates reported in Table 4.5.

Table 4.5

ESTIMATED TOTAL NORTHERN ONTARIO WOOD FIBRE REQUIREMENTS (MILLIONS OF CUNITS)

	Softwood	Hardwood
Pulpmills	5.12	.57
Sawmills	3.00	.20
Less: Sawmill Pulpchips	1.65	.11
Net Fibre Requirement	6.47	.66

Sources: Table 4.4; calculations in the text based on assumed normal lumber production and conversion formula.

[10] Reed (1980), Table 5. Hardwood fibre requirements were not calculated in Reed's report.

[11] *Veneer & Plywood Mills* (Statistics Canada 35-206), Table 5.

[12] *Miscellaneous Wood Industries* (Statistics Canada 35-208), Table 5.

Direct comparison of net fibre requirements with the annual allowable cuts for the province reported in Table 4.2 *suggests* the presence of surplus wood in Northern Ontario on the order of 1.3 million cunits of softwood and 3.4 million cunits of hardwood. This conclusion would be far too optimistic, however. There are several reasons to believe that currently reported annual allowable cuts are more or less inaccurate and *seriously overestimate* the actual supply of fibre available to the industry on a sustained basis at present levels of logging utilization and softwood-hardwood fibre proportions for pulp and lumber.

The following sub-sections examine the reasons for believing that reported annual allowable cuts overestimate industrial fibre supplies actually available.

- Accelerated plus liquidation harvesting, as described in the first section of this chapter, means that current AAC's are not sustainable to the year 2000. Accelerated harvesting of old-growth wood means that, as new allowable cuts are calculated in MNR 20-year planning periods, the AAC for Northern Ontario softwoods could decline to approximately 6.3 million cunits from the present level of 7.8 million cunits on Crown and private lands.[13] Since hardwood removals are considerably less than the AAC, the decline may not be as large for the hardwood AAC. For softwood fibre, the projected allowable cut for the year 2000 falls slightly below the estimate of current industrial fibre needs in Table 4.5.

- Withdrawals of productive forest from wood production will materially affect fibre supplies. The Crown AAC calculation in the section titled: *The Methodology of Allowable Cuts* was based on a harvest volume (at full utilization of merchantable volume) of about 15 cunits per acre on a productive land base of 85 million acres of Crown land in the province. Ministry of Natural Resources estimates in 1976 place the total of productive Crown land actually available for wood production at 51.4 million acres after various deductions reflecting the multiple-use nature of the forest resource and the low productivity or inaccessibility of some areas previously considered

[13]Reed (1980), p.8.

fully productive.[14] Annual allowable cuts would also be adversely affected by any extraordinary fire losses or insect infestations. If these deductions were included at present yields per acre, the provincial total AAC would fall. These deductions have not been made however, partly because it is possible that wood shortages would lead to a return of some withdrawn areas to fibre production and partly because the remaining acreage will be more productive than the provincial average.[15]

- Allowable cuts on harvested areas are not fully removed in the logging process. The utilization standards upon which allowable cuts in Ontario are based are not realized in practice. For softwoods, about 85 per cent of the allowable cut on acres harvested is actually removed for industrial fibre while only 50 per cent of hardwood AAC's are utilized in harvesting.[16] From 2 to 7 cunits per acre of allowable cut volumes are left in the woods.[17] If present utilization standards are not improved, the effective supplies available from current AAC's are reduced from 7.8 million cunits for Northern Ontario softwoods to 6.6 million cunits and from 4.1 million cunits of hardwood fibre to 2.1 million cunits to allow for logging waste. These are drastic reductions and substantially alter the relevance of allowable cut calculations as measures of supply availability.

- Forest Resource Inventory-based estimates of allowable cuts tend to overstate realizable allowable cuts. For many areas, detailed (operational cruising)

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[14]Ibid, pp.3-4. See Table 4.6. Some deductions are in the 'potentially exploitable' area discussed below.

[15]In a 1972 study, the Division of Forests planned on obtaining a sustained yield of 12 million cunits from 60 million acres of planned productive forest (*MNR*, 1972, p.39). This implies a mean annual increment (MAI) of about .2 cunits of merchantable volume per acre and a yield of 20 cunits/acre at harvest (assuming a 100 year rotation). This is about 30-35 per cent higher than full-utilization yields as presently calculated and 60-70 per cent above realized average yields per acre at present.

[16]Reed (1978), p.15.

[17]Heeney (1978), p.31.

Table 4.6

ESTIMATED LAND BASE FOR FOREST PRODUCTION IN ONTARIO
(AREAS IN THOUSANDS OF ACRES)

Land Classification	Crown Land	Patent Land	Total
Total Land Area[1]	188,952	29,678	218,630
Total Forested Land[1]	186,544	12,092	198,636
Total Productive Forest Land[1]	94,900	10,362	105,262
Deductions for:			
Accessibility[2]	14,768	-	14,768
Operability			
- fragile sites[3]	6,404	406	6,810
- low productivity[4]	7,648	674	8,322
Other Uses			
- provincial parks	2,788	-	2,788
- federal parks	472	-	472
- park reserves	519	-	519
- proposed wilderness areas	1,195	-	1,195
- wildlife areas[5]	2,200	-	2,200
- utilities, roads, agriculture, aesthetics, etc.	7,506	4,511	12,017
Total Deductions	43,500	5,591	49,091
Total Additions	-	4,783	4,783
Area Available for Production	51,400	9,554	60,954

[1]Dixon, R.M., Forest Resources of Ontario, 1963.

[2]Area of productive forest land in Northern Ontario beyond the northern boundary of accessible forest.

[3]Areas of productive forest land managed primarily to regulate stream flow, prevent erosion, hold shifting sand or exert any other beneficial influence. Timber may be cut from this area under special cutting prescriptions designed to protect the site.

[4]Areas of productive forest land bearing timber which cannot be harvested economically because of low yield per acre, size and/or quality of tree.

[5]Areas such as deer yards, caribou habitat, etc. Timber harvesting may be allowed on some areas under special conditions.

Source: Reed (1980)

evaluations of the available merchantable volumes have not been completed and allowable cut estimates rest on the less precise methods of the Forest Resource Inventory (FRI). In some areas operational cruise information has revealed that FRI estimates have overstated the AAC by as much as one-third. The appropriate reductions that should be applied to Northern Ontario AAC's to allow for this problem cannot be ascertained at present.[18]

- Management plans are frequently outdated and incomplete, particularly for Order-in-Council licenced areas. Submission of management plans for their licenced units is the responsibility of the licensees and the management plans indicate the AAC and the projected harvesting regime. As Table 4.7 shows, management plans are very substantially in arrears for company units, with only 2 out of 17 company management plans meeting the approved standard of information required by the Forest Resources Group in 1979. Without Ministry-approved inventory data, it is extremely difficult to achieve accuracy in the allowable cut estimates. Incomplete management plans, combined with the limitations of the FRI data, mean that Ontario's AAC figures are relatively unreliable and are probably too optimistic even granted their other shortcomings (already discussed) as indices of fibre availability. Immediate correction of the company management plan situation is a requirement of the Forest Management Agreements now being negotiated for certain Order-in Council licences. (see Appendix 4-C.)

- Annual allowable cuts will include acreage that has not been adequately regenerated following harvesting. Productive forest land will include young-growth areas that are less than 100 per cent stocked with trees. For black spruce, for example, 60-70 per cent stocking on an area classifies it as productive forest. In more extreme cases, the productive forest will

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[18]"Compared to operational cruises, FRI estimates have been found to overestimate volumes by as much as one third. As a result, allowable cuts may be substantially overestimated in some regions from this cause alone." Reed (1978), p.47. FRI inventories are preliminary estimates of timber volumes based on cruising samples extrapolated to whole areas with the assistance of aerial surveys. The Ministry is currently revising its F.R.I. to correct certain deficiencies.

Table 4.7

MANAGEMENT PLAN SITUATION IN ONTARIO

Plan Status	Year								
	71	72	73	74	75	76	77	78	79
Crown Units									
Approved standard	33	33	36	38	40	56	64	64	65
Being prepared or revised	14	25	27	33	31	20	15	15	14
New inventory required	0	0	0	8	8	3	3	3	3
Inactive	8	10	10	9	9	9	6	6	6
Initial plan in force	32	18	13	0	0	0	0	0	0
Total	87	86	86	88	88	88	88	88	88
Company Units									
Approved Standard	29	29	2	2	2	2	2	2	2
Submitted for approval	11	11	0	0	0	2	2	2	3
Being prepared or revised	17	17	24	29	29	27	8	8	8
New inventory required	0	0	0	0	0	0	14	14	4
Initial Plan in force	0	0	33	0	0	0	0	0	0
Total	57	57	57	31	31	31	26	26	17

Source: Ministry of Natural Resources, *Annual Reports* (1971-79)

have declined because unsatisfactory regeneration has taken place: the Forest Resources Group estimates that about 125,000 acres per year in the mid-1970's was lost to production in Northern Ontario owing to lack of artificial or natural regeneration of cutover land.[19] The loss of 125,000 acres per year on average would, in the course of a decade, involve a reduction of productive forest land in Northern Ontario amounting to about 1.75 per cent of the total.

- Aggregate comparisons of fibre supplies and requirements for Northern Ontario as a whole may mask specific regional aspects of wood availability. The timber resource is heterogeneous in nature and involves high transport costs for inter-regional movements so that overall supplies in relation to manufacturing requirements need not indicate the specific wood supply situation for any one of the four Ministry of Natural Resources regions or for the area in the vicinity of the 50th parallel relative to other areas in Northern Ontario. The issue of regional wood balances is sufficiently important to warrant separate sections: the next section examines the issues for the MNR regions of Northern Ontario, while the section following reports the supply and requirements situation for management units intersecting and north of 50° latitude.

The foregoing examination of allowable cuts and industrial requirements for the Northern Ontario sector as a whole suggests some preliminary conclusions that will not be altered - indeed will be reinforced - by the more disaggregated examination to follow. First, the present state of information available on Ontario's wood supplies is not sufficiently precise to give assurance that allowable cuts accurately estimate volumes of merchantable wood available even if the productive land base assumptions and utilization standards assumed in AAC calculations are correct. On balance, the absence of approved management plans for many management units and the preliminary nature of the Forest Resource Inventory volume calculations mean that allowable cuts are probably overestimated - to an uncertain degree - *before* making allowance for withdrawals of productive land and under-utilization of AAC's in the logging process. The latter adjustments lead to a *definite* decline in the availability of fibre relative to allowable cuts.

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[19] Heeney (1978).

The AAC calculations assume a level of utilization that is not being achieved and, even if the utilization level assumed in AAC calculations was achieved, AAC's will decline as accelerated removals lower AAC's to the sustained level in the future. As a result, fibre supplies are not only insufficient to support additional manufacturing capacity, they are inadequate to support existing capacity without major improvements in utilization.

The Ministry of Natural Resources has commented on the tightening wood supply situation in Northern Ontario, a concern echoed by the Ontario Economic Council (1976). In both Northeastern and Northwestern Planning Regions (Chart 1.1), Ministry land use assessments show that industrial capacity in the late 1970's was approaching annual allowable cuts. Long-term production targets for the Northeastern Region are being revised "...to deal with the unexpected pace of industrial expansion that has occurred in recent years".[20] In the Northwestern Region, "...predictions for industry expansion indicate that almost the full allowable cut (all species) of the Region will be required within the next 5 to 10 years..." such that forest production plans are now "...under review as a result of recent approved industrial expansion".[21]

The Forest Resources Group is in the process of redefining allowable cuts in terms of the reduced production forest base shown in Table 4.6. At the same time, as mentioned, wood requirements have increased sharply during the 1970's. Though newsprint capacity has been comparatively stable (Table 1.2), kraft pulp capacity in Ontario has increased by 80 per cent from 1970 to 1980 (Table 1.4) and lumber production has nearly doubled since the late 1960's (Table 1.6). There is no doubt that the Ministry's planning framework has been strained as a result. Accurate allowable cut measures related to specific geographic areas and the relationship of allowable cuts to actual wood supplies are much more important in 1980 than in 1970 - the intervening growth of fibre requirements greatly intensifies the need to define the limits of sustainable supply over the near future.

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[20]Ontario MNR (1978), p.148.

[21]Ontario MNR (1974), p.54; Ontario MNR (1977), p.36.

REGIONAL CONSIDERATIONS*

The relationship between allowable cuts and fibre requirements varies across the four Ministry of Natural Resources regions that make up Northern Ontario. As the above section has already indicated, allowable cuts do not provide an accurate measure of fibre supplies actually available to pulpmills and sawmills so measures of *relative* scarcity only are implied by the comparisons of the present section. In addition, interregional movements of logs and chips means that regional information should be viewed with more circumspection than the aggregate Northern Ontario figures. These *caveats* duly noted, Table 4.8 summarizes the recent data collected by Reed (1980) at the request of the provincial pulp and paper companies. The data refer to softwood allowable cuts and requirements only. As the previous section showed, it is for softwoods that the problem of wood scarcity is most acute since 90 to 95 per cent of current wood needs are for these species, and the relation between requirements and supplies is tightest for softwoods in the province as a whole. Chart 1.1 identifies the boundaries of the geographical regions referred to in Table 4.8.

For Northern Ontario as a whole, the ratio of softwood requirement to softwood allowable cut is, at present, 82 per cent (Table 4.8, ratio of total Northern Ontario net requirement to total Northern Ontario allowable cut). This percentage can stand as a benchmark with which to judge the relative scarcities in the individual administrative regions.

Supplies are somewhat tighter in the Northwestern region than in the province as a whole, with a requirement to allowable cut ratio of 88 per cent. If the two northern Crown Management Units are added back into the allowable cut calculations (Table 4.3), the ratio declines to 70 per cent, however. Excluding these two units, Order-in-Council licences of pulp and paper companies (Boise-Cascade, Great Lakes Forest Products, and Abitibi Price) and one lumber company account for about 70 per cent of the AAC (about 1.3 million cunits per year). The pulp and paper companies must obtain approximately .2 million cunits over and above their long-term licenced cuts through licences and volume agreements on Crown Management Units. For these supplies, they are in competition with sawmillers. Reed states that fibre supplies in the Northwestern region appear to be adequate to support

*This section relies on information in Reed (1980), Chapter 4.

Table 4.8

NORTHERN ONTARIO REGIONAL AAC'S AND FIBRE REQUIREMENTS
Softwood
(MILLIONS OF CUNITS)

Region	(1) AAC	(2) Pulpwood Requirement	(3) Sawlog Requirement	(4) Pulp Chip Availability	(5) Net Requirement	(6) Balance
Northwestern	1.80*	1.50	.24	.14	1.60	.20
North Central	2.80	2.50	.80	.50	2.80	0
Northern	2.40	1.20	1.40	.80	1.80	.60
Northeastern	.80	.10	.20	.11	.19	.61
Total Northern Ontario	7.80	5.30	2.64	1.55	6.39	1.41

Source: Reed (1980), Chapter 4.

*Excludes AAC from two northern Crown Management Units (See also Table 3.3) AAC include Crown (7.5) and private (.3) lands compared to Crown lands only in Table 3.3. The Reed figures used here differ from our own total figures in Table 3.5 in that Reed assumes slightly *higher* pulpmill requirements and *lower* lumber requirements. The net fibre requirement is about the same in both. See also note to Table 4.2.

immediate requirements.[22] If the argument of the previous section concerning the limitations of allowable cut figures as indices of fibre supply is accepted however, existing requirements exceed supplies at present utilization levels on a sustained basis here as elsewhere in Northern Ontario.

Wood supplies are tightest in the North Central region where the ratio of net requirements to annual allowable cut is 100 per cent. The pulp and paper companies dominate forest-based activity in this area, holding 90 per cent of allowable cut on Crown lands. Nearly all Ontario's major pulp and paper companies - Abitibi-Price, American Can, Boise-Cascade, Domtar, Great Lakes, Kimberly Clark, and Ontario Paper - have operating limits in the North Central area and nearly half of Northern Ontario's total pulpwood requirements originate here. As and when wood availability declines, the independent sector will feel the pressure first since much of their wood supply takes the form of third-party agreements with the pulp and paper companies.

In the Northern region, net requirements relative to the allowable cut are lower than in Northern Ontario as a whole - 75 per cent. The pulp and paper companies - Abitibi, E.B. Eddy, Ontario Paper and Spruce Falls - hold about 55 per cent of the allowable cut under Order-in-Council licences, while the remaining supplies are allocated principally to sawmills from Crown Management Units. The sawmill sector is extremely prominent in the Northern region: over half of total sawlog requirements in Table 4.8 originate in this part of Northern Ontario. Major sawmill concentrations occur at Hearst and Chapleau. The presence of these concentrations places local pressure on wood supplies and prevents the sawmills from realizing an important component of pulpchip revenues. The pulp and paper companies hold about 55 per cent of the regional annual allowable cut under long-term licences, and the sawmills obtain their supplies from Crown Management Units, third-party agreements with the pulp and paper companies, and privately-owned forests. The latter two sources of supply are particularly vulnerable to reductions in the future so that the supply problem for independent sawmillers in the Northern region - already tight - is likely to become worse over the next few years.

The only region of Northern Ontario in which adequate wood supplies appear to be present is the Northeastern region.

[22]Reed (1980), 23.

Here, the ratio of softwood net requirements to annual allowable cut is 24 per cent compared to the Northern Ontario average of 82 per cent. The only long-term licence-holder (E.B. Eddy) has an annual allowable softwood cut of .12 million cunits, about 15 per cent of the total for this relatively small sector of Northern Ontario. Softwood sawmills are adequately supplied from the remaining area with sawlog requirements and pulpchip availabilities as shown in Table 4.8.

With the exception of the Northeastern region, the extremely tight supply situation described in the previous section is characteristic of each of Northern Ontario's administrative regions. Of particular concern is the close relationship between net requirements and allowable cuts in the large and important North Central region and the localized sawlog supply shortages now apparent in the Northern region.

The three largest regions of Northern Ontario have a north-south orientation extending from the relatively accessible areas adjacent to the United States boundary and the Great Lakes to the northern limits of Ontario's forests. It is important to determine the extent to which the more northerly management units and the forests beyond these management units are capable of supplying fibre to the industry and the extent to which harvesting is now underway in these areas. Examination of these questions gives a different regional perspective to the availability issue and can help to identify pressures on the forest products industry to extend harvesting into the area in the vicinity of 50° latitude. A northerly movement of harvesting will, among other effects, tend to raise the already high level of wood costs experienced by the industry. These issues are the subject of the following section.

SUPPLIES IN THE VICINITY OF 50° LATITUDE

Examination of wood fibre supplies and present harvesting patterns in the far north of the province necessitated the construction of a new regional breakdown oriented to the 50th parallel (Chart 4.1). The *50-North region* is defined as all licenced and Crown management units that lie north of *or intersect* 50° latitude plus surveyed forested areas north of such management units. The latter surveyed areas (beyond present management units) are referred to as the *potentially exploitable area* and represent the extreme margin of Ontario's forest resource.

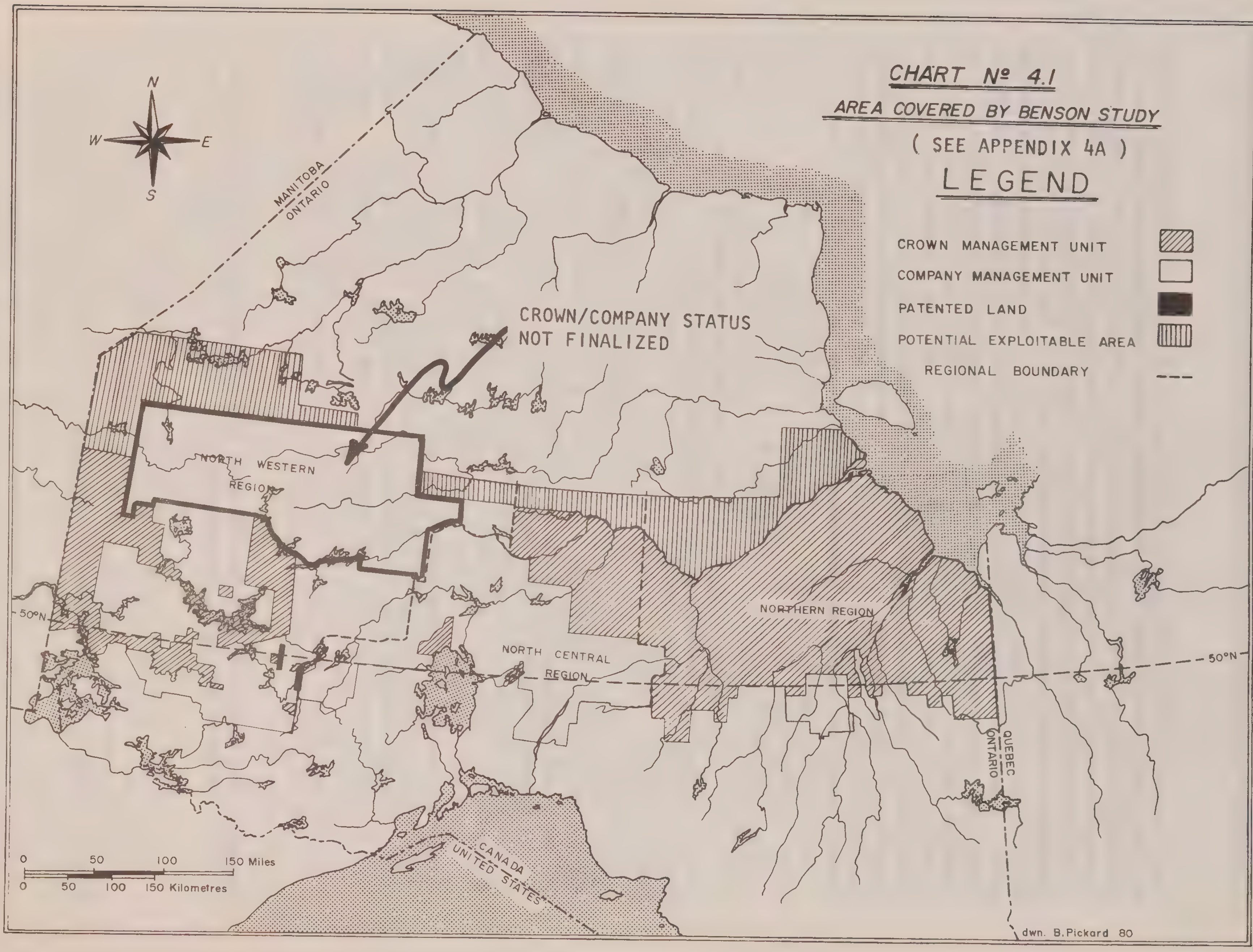
CHART Nº 4.1
AREA COVERED BY BENSON STUDY
(SEE APPENDIX 4A)
LEGEND
CROWN MANAGEMENT UNIT
COMPANY MANAGEMENT UNIT
PATENTED LAND
POTENTIAL EXPLOITABLE AREA
REGIONAL BOUNDARY
CROWN/COMPANY STATUS NOT FINALIZED
N
S
W
E
MANITOBA
ONTARIO
NORTH WESTERN REGION
NORTH CENTRAL REGION
NORTHERN REGION
QUEBEC
ONTARIO
CANADA
UNITED STATES
50°N
50°N
0 50 100 150 Miles
0 50 100 150 Kilometres
dwn. B.Pickard 80

For the *50-North region* and the *potentially exploitable area* within it, estimates of allowable cuts and present harvest volumes have been constructed by C.A. Benson of the Lakehead University School of Forestry with the assistance of officials from the Ministry of Natural Resources.* The aggregate results - applicable to the whole of the 50-North region and the potentially exploitable area - are presented in Table 4.9. For softwoods in this region, the total annual allowable cut at present is estimated at 4.56 million cunits, nearly 60 per cent of the annual allowable cut for all of Northern Ontario shown in Table 4.2. In the hardwoods category, the 50-North annual allowable cut is 1.15 million cunits or 28 per cent of the Northern Ontario total. In the aggregate, the 50-North area examined by Benson contains just less than half of Northern Ontario's AAC.

Table 4.9

ESTIMATED ANNUAL ALLOWABLE CUT AND ACTUAL HARVEST
50-NORTH REGION (MILLIONS OF CUNITS)

	Softwood	Hardwood	Total
AAC on Company Licenced Units	3.35	.78	4.14
AAC on Crown Management Units	.82	.21	1.03
AAC on Potentially Exploitable Area	.38	.16	.55
Total AAC	4.56	1.15	5.72
Actual Cut on Company Licenced Units	1.31	.05	1.35
Actual Cut on Crown Management Units	.35	.01	.36
Actual Cut on Potentially Exploitable Area	neg.	neg.	neg.
Total Actual Cut	1.66	.06	1.71

Source: Estimates by C.A. Benson (see text and Appendix 4-A.) Figures may not add due to rounding.

*Description of procedures appears in Appendix 4-A.

It is worthwhile comparing harvesting pressures for the area in the vicinity of 50° latitude (50-North region) with the harvesting pressure in Northern Ontario as a whole. As Table 4.9 illustrates, the actual softwood harvest is about 37 per cent of the annual allowable cut while the hardwood harvest stands at 5.2 per cent. As the previous section pointed out, the present ratio of softwood fibre requirements to the annual allowable cut for all of Northern Ontario is 82 per cent. For hardwoods, the comparable figure is 16 per cent (from Tables 4.2 and 4.5). Clearly, present requirements are being drawn very largely from the more accessible forested areas of the province and the 50-North region has not yet been the object of substantial exploitation.

The tapering off of harvesting pressure as one moves north can be illustrated further by sub-dividing the 50-North area. In two studies, published in 1974 and 1978, Reed examined wood supplies and harvests for four Ontario regions including an area designated here as *Reed Region 1.*[23] This area is north of the 50° latitude and therefore excludes several of the management units intersecting that latitude and includes most of the potentially exploitable area in the Benson study. Chart 4.2 illustrates *Reed Region 1.*[24] In this region, the softwood annual allowable cut was calculated at .96 million cunits with an average harvest of about 2 thousand cunits, while the hardwood AAC was .28 million cunits with a negligable harvest. Thus, *Reed Region 1* is essentially the unutilized area in the northern part of the *50-North region* shown in Chart 4.1. A more northerly orientation defines the potentially exploitable area in the Benson study. Since this potentially exploitable area is smaller than - Reed Region 1, the harvest is also zero. Annual allowable cuts from Table 4.9 are .38 million cunits for softwoods and .16 million cunits for hardwoods. Table 4.10 summarizes the existing relationships between allowable cuts and harvests for the regions discussed. Since regions lower in the table are further north, the tapering of harvests relative to allowable cuts as geographical inaccessibility increases can be seen quite

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[23]Reed (1974), Reed (1978). The 1974 study was for the Department of Industry, Trade, and Commerce. The 1978 study was for the Canadian Forestry Service.

[24]It includes the Albany Management Unit, Little Current MU, Dusey MU, part of Kimberly-Clark's licenced area, the Lake St. Joseph MU, part of the proposed Great Lakes expansion area and the Berens River MU plus forests beyond these units, principally in the northwest. Reed Region 1 is not precisely contained in the Benson study area: Reed excludes the area north of the Albany River in Northeastern Ontario while this area is included in the Benson study area.

Chart 4.2: Reed Region 1

Source: Reed (1978), p.15.

clearly. Nearly one million cunits of softwood allowable cut are in Reed Region 1 with a virtually zero harvest rate. In order to sustain present requirements *given the reservations about allowable cuts as supply measures* discussed in the next to last section, Ontario's forest products industry will have to reach increasingly into the 50-North region and Reed Region 1 with resulting increases in the mill costs of fibre to sustain present needs.

Table 4.10

WOOD AVAILABILITIES: VARIOUS NORTHERN REGIONAL DEFINITIONS
(MILLIONS OF CUNITS)

	Softwoods		Hardwoods	
	AAC	Harvest/ Requirement	AAC	Harvest/ Requirement
Northern Ontario	7.80	6.37	4.10	.65
50-North	4.56	1.66	1.15	.06
Reed Region 1	.96	neg.	.28	neg.
Potentially Exploitable	.38	0	.16	0

Sources: Tables 4.2, 4.5, 4.9; Reed (1978).

In addition to the *overall* far north examination of annual allowable cuts in relation to harvests, Benson's study examined the breakdown of wood availability and harvests over the three Ministry of Natural Resources regions (Northwestern, North Central, and Northern) that extend into, and form, the 50-North region itself. This disaggregation permits identification of fibre availability in 50-North in a more detailed manner (Table 4.11). Of the total 50-North allowable cut of 5.72 million cunits per year, 3.53 million or 61 per cent is in the Northwestern region and it is here that the relationship between current harvests and wood supplies is most favourable. In contrast to the North Central and Northern regions where over half the softwood allowable cut goes into harvest volumes, the ratio of harvesting to softwood AAC is

Table 4.11

REGIONAL ANNUAL ALLOWABLE CUTS AND ACTUAL HARVESTS FOR 50-NORTH
(MILLIONS OF CUNITS)

	Northwestern			Northcentral			Northern		
	Softwood	Hardwood	Total	Softwood	Hardwood	Total	Softwood	Hardwood	Total
AAC on Company Units	2.22	.40	2.61	1.00	.38	1.38	.13	.01	.14
AAC on Crown Units	.43	.12	.55	.06	neg.	.07	.33	.08	.41
AAC on Potential Area	.21	.09	.30	.04	.02	.06	.14	.06	.20
Total AAC	2.86	.61	3.46	1.10	.40	1.51	.60	.15	.75
Actual Cut-Company Units	.67	neg.	.67	.56	.03	.59	.08	.02	.10
Actual Cut-Crown Units	.14	neg.	.14	0	0	0	.21	.01	.22
Total Actual Cut	.81	neg.	.81	.56	.03	.59	.29	.03	.31

Source: Benson Study. Figures may not add due to rounding.

less than 30 per cent in the Northwestern area of the 50-North region.

The forest products industry in Northern Ontario has concentrated its harvesting efforts, as might be expected, in the more accessible locations. Previous sections have indicated that current fibre requirements exceed present and foreseeable supplies at existing standards of utilization and with the existing allocation of forested land between industrial and non-industrial uses. Chapter Three has shown that present delivered wood costs in Northern Ontario are already higher than other North American locations. The industry is therefore faced with possible wood shortages in the not-too-distant future (immediately if AAC's were to be revised downward to reflect the *sustained* supply) and with rising wood costs as the margin of harvesting is extended into more remote areas. A federal-provincial agreement has already been signed (in December 1978) allocating $60 million to construction of access roads in Northern Ontario additional to the roads already planned by the government of Ontario and the forest companies.[25]

The cost of harvesting will be sensitive to the areal density of fibre and tree size. In a recent article examining conditions in British Columbia, Berndt, Cox, and Pearse (1979) have found that average logging costs per cunit are importantly influenced by standing volume per acre. This is to be expected since lower areal density increases road access costs, camp costs, and reduces the productivity of men and equipment in the woods. Table 4.12 suggests the kind of areal fibre density differences prevailing in Northern Ontario. The figures *should not* be interpreted as allowable cuts on productive forest land since the areas involved are total areas including water, unproductive land, transportation networks, and townships. The data are nevertheless indicative of relative volumes per unit area. The *potentially exploitable* region has an areal fibre density less than *half* the density on company management units in the 50-North region. The same wood supply for a typical mill located in the potentially exploitable area would require a timbershed of more than twice the area required by such a mill located in existing company-licenced areas intersecting the 50° latitude. If, as would be the practical case, the manufacturing facility was located at its present site (south of 50°), costs would be increased even further owing to the added hauling distances from the

[25]Canada-Ontario Subsidiary Agreement - *Forest Management* (December 1978).

northerly reaches of the forest. An additional cost margin would also appear where areas of the northern terrain are less hospitable to harvesting and wood transportation than areas presently being cut.

Table 4.12

ALLOWABLE CUTS AND TOTAL AREAS IN 50-NORTH

Region	AAC (000 Cunits)	Area (Square Miles)	AAC-Cunits/ Sq. Mile
Northwestern			
Company Units	2,679	40,000	67.0
Potentially Exploitable	294	10,200	28.7
North Central			
Company Units	1,383	17,100	80.9
Potentially Exploitable	55	1,900	28.7
Northern			
Company Units	145	1,800	80.7
Potentially Exploitable	198	6,900	28.7

Source: Benson Study

POLICY CONSIDERATIONS

The emerging overall shortage of fibre in Ontario and the gradual pressure to shift cutting activities into less accessible areas should serve as justifications to re-examine several aspects of Ontario forest policy. The present section focuses on three major issues: incentives to fuller utilization of allowable cuts, adjustment of allowable cuts to reflect actual productive forest acreage allocated to industrial use, and the effect of rotation periods on wood supply.

Given that about 85 per cent of softwood and 50 per cent of hardwood volumes in the allowable cut figures are actually removed in the logging process, softwood forest depletion could

theoretically be reduced by 15 per cent with no loss of softwood fibre supply and hardwood harvest volumes could theoretically be raised by 100 per cent at the same level of hardwood depletion. Utilization should be responsive to economic incentives. In 1967, the Ontario Committee on Taxation recommended that the Ministry of Natural Resources (then the Department of Lands and Forests) move away from collecting stumpage revenues on the basis of scaled harvest volume in favour of annual charges based on volumes calculated in allowable cuts.[26] The effect of this would be to remove *all* charges per unit of harvest volume within the allowable cut figure: smaller and less accessible trees that might not repay stumpage calculated on a unit volume basis might then be profitably harvested, raising utilization standards toward the levels assumed in Ontario's AAC calculations. The licensee's total annual charge would be based on AAC's both of softwoods and hardwoods with somewhat lower rates per cunit of allowable cut applied to the latter. Annual charges could still be linked to mill selling prices for lumber and pulp and paper products as they have been since the 1978 amendment to the Crown Timber Act.[27] An additional incentive to hardwood utilization *could* be introduced by *subsidizing*, on a per cunit of harvest basis, the removal of hardwoods. The subsidy could be adjusted so that, at full utilization of the hardwood AAC on a licence, the licensee would obtain a total subsidy approximately equal to the annual charge on the hardwood AAC. Similar arrangements could be applied to timber harvests from Crown Management Units. The combined effect of an incentive system of this kind should be to raise utilization across all species and to place a particular premium on the use of hardwoods in pulp furnish and lumber manufacture. An additional step would be the reduction of allowable cuts on licenced areas to reflect the actual utilization standards practiced on those specific licences. It should also be recognized that the new Forest Management Agreements (FMA's) will assist in the achievement of better utilization since the companies themselves must face the problems for regeneration stemming from excessive logging slash and unused trees on their cutover areas.

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[26] Ontario Committee on Taxation (1967), Vol. 3; See also Nautiyal (1977) and Pearse (1974), Chapter 10.

[27] *An Act to Amend the Crown Timber Act* (Assented June 23, 1978). Current stumpage charges, reported in Appendix 4-B, offer some incentive to hardwood utilization and utilization of less accessible fibre. See also Appendix 4-C.

There appears to be scope for increased use of hardwoods in pulping and lumber manufacture. About 10 per cent of Ontario's pulp furnish is presently in the form of hardwood. Paper strength is importantly affected by the length of fibres and the shorter hardwood fibres lead to poorer binding than long-fibre conifers. The alignment and flexibility of hardwood fibre cell walls are also inferior to those of the softwoods further reducing paper strength. Some of these problems can be alleviated through modifications in pulping conditions and optimum mechanical treatment of the pulp. Hardwoods pulp readily by the kraft process or any other alkaline process. Lower lignin content and more permeable vessels actually lower pulping time and yields can be higher than for softwoods. The sacrifice of strength in hardwood pulps is magnified however for mechanical pulps. The modification of fibres through the mechanical process and the high lignin content inhibits paper strength. Hardwood stone groundwood and refiner groundwood pulps are weaker than their softwood counterparts and both are much weaker than the kraft pulps. Thermomechanical pulps from softwoods still require the addition of some chemical furnish for the manufacture of newsprint and a hardwood thermomechanical pulp could require a 50 per cent chemical furnish. Thermomechanical pulping (and its variants) represents a rapidly moving technological front in the industry. Researchers at United Paper Mills in Finland report trial production of thermomechanical pulp for newsprint using 50 per cent hardwood fibre (Huusari & Syrjanen, 1980). With reservations, Northern Ontario mills can be expected to attempt increased substitution of hardwood for the better quality softwood pulps, particularly in chemical (kraft) processes if incentives are present to do so.[28]

Lumber operators report that poplar and white birch are more difficult to work with than softwoods. The hardwoods have longer drying times and tend to twist and warp as the moisture content is removed. Birch has more imperfections and tends to split. One operator reports efforts to test the market for volumes of poplar lumber.[29] Other things equal, sawmills are anxious to remain with the higher value softwoods though

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[28]The above discussion is based on communication from A.F. Gilbert, School of Engineering, Lakehead University. See Gilbert (1980). Copies available from the author on request.

[29]Communication from R.B. Gallupe, School of Business Administration, Lakehead University, based on discussions with Northern Ontario sawmill operators.

shortages or incentives of the type just described could have an important effect on the types of species sawn.

In addition to efforts to improve general utilization through the timber revenue mechanism, allowable cut adjustments in response to less than satisfactory harvest to depletion ratios, as well as incentives to the use of hardwoods by pulpmills and sawmills (again through the timber revenue mechanism), the Ministry of Natural Resources will have to reduce AAC's where productive forest land has been reduced (Table 4.6). For softwoods at least, shortages will surely appear under these circumstances. Such shortages will impose timber allocation problems on the Forest Resources Group as and when they arise. The allocation of large timber areas to pulp and paper companies and the use of non-market determined stumpage charges reflect an era of relative fibre abundance. The normal market solution would be to permit increases in annual allowable cut charges (or per unit stumpage charges under the present system) to reflect the appearance of excess demand. Two difficulties can be apprehended with such a market solution. First, bidding for stumpage has long been suppressed under the dominant Order-in-Council licencing system in Ontario.[30] Second, market pricing in the face of shortages would have the effect of raising wood costs in a region already suffering from important relative wood cost disadvantages in the North American system (Chapter Three).

One response to the question of shortages is simply to defer reductions in the AAC's. Unless productive forest land devoted to industrial fibre production can be increased, deferred AAC reductions will lead to larger shortages in the near-term future. A second answer is to reduce AAC's now but circumvent the market by reducing softwood fibre supplies through a rationing mechanism supported by real restrictions on the appearance of new capacity requiring softwood fibre.

With strong final product demand, a rationing or quota system would still lead to increases in pulpwood and sawlog prices as quotas became the objects of bidding for resale. So a rationing system alone will contain wood costs only if accompanied by a ban on resale of timber quotas. While

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[30]The FMA's further solidify the pulp and paper companies' long-term rights to timber on their licenced areas by attaching regeneration responsibilities to these areas and by crediting the results of successful regeneration to the licensee's future allowable cuts.

flexible prices discourage entry in a semi-automatic manner, quotas (with the resale ban) would have to be accompanied by new capacity restrictions to prevent wood supplies from being divided over larger numbers of producers at the expense of average operating rates. Allocation of quotas between pulp and paper companies and sawmills could become very contentious.

Whichever method of dealing with shortages - pricing or rationing - is adopted, the important feature is that *an explicit signalling mechanism of one kind or the other be in place to transmit scarcity messages to the Northern Ontario forest products sector.* Without an unambiguous perception of scarcity, attempts to economize on fibre requirements will not be seen as economically worthwhile to many operators. Substitution of thermomechanical pulp for chemical and stone groundwood pulps in newsprint production, for example, is a wood-conserving step that may be prompted by perceived fibre scarcity. Similarly, a decision to substitute northern hardwoods for conifers in pulp furnish or lumber production should be affected by their relative scarcities in relation to their technical qualities.

The foregoing discussion has accepted without comment the Forest Resources Group's choice of rotation periods for Ontario species (Table 4.1). These rotations, adapted to the forest products industry's preferences for trees of a minimum size, need not be viewed as immutable. Maximum sustained yield rotations could be shorter; financial rotations might be considerably shorter.[31] For pulpwood, a move to shorter rotations might have to be accompanied by changes in de-barking methods or increased acceptance of bark in pulp furnish. Sawmills would have greater difficulty selecting sawtimber and would face increased costs from sawing smaller diameter logs. Harvesting costs would also increase. Notwithstanding these effects, shorter rotations would have the immediate effect of classifying additional volumes as beyond rotation age and subject to accelerated removal. Once the accelerated cutting is more or less complete, AAC's will decline owing to the smaller size classes at harvest implied by reduced growing periods of the remaining stands. If the forest is fully renewed, shorter rotations may *not* lead to a decline in Ontario's (very) long-run rate of fibre production however. A 10 per cent reduction in the rotation period, for example,

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[31]Financial rotation theory adapts the rotation period to the maximization of net present value of growing timber. A discussion and bibliography appears in Anderson (1979).

with a constant area of land under forest management will reduce the per acre yield at harvest but if this reduction is *less* than 10 per cent, the total long-run level of production will rise owing to the 10 per cent increase in the annual area harvested.[32] The sustainable level of fibre production in the province can also increase if the area of land under active forest management increases through effective treatment of the backlog of "not sufficiently regenerated" (NSR) acreage, more intensive management of existing productive acreage, or an expansion of the definition of productive forest land relative to total forest land (Table 4.6). As previously mentioned, supplies can also be increased by fuller utilization of the allowable cut. Demand can be modified or reduced by the use of different manufacturing processes (wood-saving technological change) or by reductions in industrial capacity. If scarcity messages are transmitted to participants, these supply-demand adaptations can get underway. The present overestimations of supply by annual allowable cut calculations that exaggerate fibre availability do not contribute to the goal of coping with scarcity and will only make the needed adjustments *more* difficult in the immediate future as depletion becomes more obvious and pressing.[33]

[32]The maximum mean annual increment (MAI) approach ignores the fact that reducing the rotation period - while it lowers the MAI - releases acreage for the very long-run production of extra fibre and can therefore raise the *total* very long-run sustained yield.

[33]A valuable discussion of Scandinavian responses to wood supply shortages appears in Randers and Hosteland (1979).

APPENDIX 4-A

THE 50-NORTH ESTIMATES (C.A. BENSON)

- The estimated annual allowable cuts on present management units north of or intersecting 50° latitude were based on figures received from the Ministry of Natural Resources and on the author's own estimates for two units.

- Allowable cut figures obtained from the Ministry, one company, Hansard (May 3, 1979), and Sessional Paper 100, 4th Session, 31st Parliament (20 May 1980) were not always consistent. In some cases, this reflected absence of Ministry-approved management plans (See Table 4.7). In other cases, the allowable cuts are currently being calculated and will vary until finalized in a management plan or FMA.

- For three of the six company units, the preliminary AAC's calculated in 1980 were used. These AAC's are based on recent FRI data and will therefore differ from AAC's used in Reed (1978).

- The preliminary allowable cut figures for the proposed Reed-Great Lakes expansion area are included with company figures. This proposed expansion area consists of the Lake St. Joseph Management Unit, part of the Berens River M.U., plus potentially exploitable forest areas. The tract is defined in the Memorandum of Understanding co-signed on October 26, 1976 by the Minister of Natural Resources and Reed Limited.

- Annual allowable cut figures obtained in gross merchantable volumes were reduced to net merchantable figures using the *Cull Survey* Tables for the province of Ontario.

- The annual allowable cut for the *potentially exploitable area* was estimated using allowable cut volumes from Dixon (1963). Dixon's AAC volumes were reduced proportional to a yield of 10 cunits per acre. The 10 cunits per acre figure was extrapolated from adjacent units.

- Actual cuts are one to ten-year average annual cuts and had to be estimated on three management units for which data were unavailable.

- No adjustments have been made in Tables 4.9 and 4.11 to reflect utilization standards or shortcomings in the Forest Resource Inventory (FRI) volume estimates compared to operational cruises (see discussion in the text of the chapter).

- The text does not report the percentage of allowable cut composed of sawlogs. The Ministry of Natural Resources does not provide such estimates officially and the economic definition of a sawlog varies with accessibility, market conditions, and sawmill equipment.

- Calculations of AAC's in the north of 50^{o} area could alter with changes in assumed rotation periods and silvicultural practices. At the present time, very little is known concerning growth rates and silvicultural procedures for this area. See McClain (1979).

- The softwood and hardwood allowable cuts and actual cuts were prepared by species (spruce, jack pine, balsam fir, other conifer, poplar, white birch, and other hardwoods). This breakdown, not reported in the text, can be obtained from C.A. Benson on request.

APPENDIX 4-B

MINISTRY OF NATURAL RESOURCES STUMPAGE CHARGES

Northern Ontario stumpage charges consist of Crown dues plus negotiated bonuses applied *per unit* of harvest volume. These charges do not emerge as the outcome of competitive market forces under which bidding for the resource might be expected to move stumpage returns into the range of timber values derived from final products.[1] The Ministry sets charges unilaterally and they have traditionally remained fixed for extended periods. From 1954 to 1974, stumpage revenue per cunit remained quite stable in the range of $3.00 to $3.50. The Crown dues component was doubled in 1974 to reflect general inflationary trends. On the recommendation of a provincial task force (reporting in 1975), the *Crown Timber Act* has been revised (in 1978) to adjust Crown dues for inflation automatically through an indexing system.[2] Crown dues are set at basic levels plus an indexed component. In Northern Ontario, the basic level differs between conifers and hardwoods (poplar and white birch) and between operators - one rate being applied to integrated companies (pulpmills) and another to non-integrated companies (sawmills and other users). For pulpmills, the price indices are Statistics Canada's monthly industry selling price index for pulp and paper products and spruce lumber east of the Rockies. For non-integrated companies, the price index applied to conifers is the spruce lumber index while the index applied to hardwoods (poplar and white birch) is the pulp and paper index.[3]

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[1]For general discussions see Department of Lands and Forests (1967) {Brodie Report} and Ministry of Natural Resources (1974) {Crown Stumpage in Ontario}.

[2]Ministry of Natural Resources and TEIGA (1975) {Task Force on Crown Timber Revenue}. Indexing methods of stumpage price determination are also in use in Alberta and British Columba.

[3]Ministry officials state that indexing hardwoods to pulpmill prices reflects their use as woodchips.

The accompanying table shows current levels of Crown dues in Northern Ontario.

Table 4-B.1

MINISTRY OF NATURAL RESOURCES CROWN DUES (APRIL-JUNE 1980)

	Cunit	Cord
Integrated Companies		
Conifers	$7.64	$6.47
Poplar-White Birch	$1.51	$1.32
Non-Integrated Companies		
Conifers	$7.60	$6.45
Poplar-Birch	$1.38	$1.19

Source: Forest Resources Group - Timber Sales Branch

To these charges must be added bonuses that vary with accessibility of the wood. Bonuses are very low on average but may range up to $2.00/cunit for conifers and $.50 for poplar-white birch. On Order-in-Council licences, stumpage charges (Crown dues plus bonus, if any) are supplemented by annual area charges paid by the licensee. At the present time (spring 1980) the area charges are $50.10 per square mile of licenced productive forest.

APPENDIX 4-C

ONTARIO'S FOREST MANAGEMENT AGREEMENTS

Forest Management Agreements (FMA's), presently being negotiated between the Ministry of Natural Resources and the pulp and paper companies, reflect an amendment to the *Crown Timber Act* in December 1979. These agreements allow the Ministry to secure two objectives:

- Place regeneration of Ontario's Crown forests in the hands of the licensees so that harvesting and reforestation can be handled as parts of a unified silvicultural program monitored by the Forest Resources Group.

- Improve knowledge of the existing and potential resource base by incorporating more detailed and closely-supervised management and operating plan requirements on the licensee entering into an FMA.

The first objective emerges from the unsatisfactory record of regeneration efforts during the 1960's and 1970's (Heeney 1978). Under the new Agreements, the Ministry and the licensee will develop *Ground Rules* describing the forest management practices and standards to be applied to the Agreement area to secure regeneration of the forest. The Ministry will fund construction, up-grading and maintenance of specified roads and will pay (according to a schedule of rates - subject to annual review) for the silvicultural treatments (site preparation, seeding and planting, and tending) undertaken by the licensee according to the *Ground Rules*. The Ministry will also supply seed and nursery planting stock free of charge. Regeneration is to be monitored in two steps: first, examination of standards of accomplishment at the time silvicultural treatments are undertaken by the licensee as a condition for the treatment payments and, second, an examination of the actual success of regeneration efforts by the licensee five years after the treatment of cutovers.[1] The

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[1]MNR *Forest Management Manual*, December 1979, p.6.4.

latter examination serves as the basis for renewal of the FMA at five-year intervals. Each renewal is for a further 20-year period - the so-called 'evergreen' arrangement.[2] Increases in forest productivity brought about at the licensee's expense are to be available to the licensee at one-tenth of normal stumpage charges.

Regeneration of the forest land base is, as mentioned in the text of this chapter, not a solution to near-term wood scarcity in Northern Ontario, but the FMA's are significant in this context in that they will lead to greater precision in the estimation of allowable cuts on those Order-in-Council limits subject to the agreements. A substantial share of the new *Forest Management Manual* is devoted to the detailed requirements for management and operating plans. The success of the Agreements depends, indeed, on improving the quality of company management plans which have fallen below Ministry-approved standards in the 1970's (Table 4.7) and in the implementation of 5-year operating plans, annual plans, and annual reports for the Agreement areas. Annual allowable cuts are to be recalculated at 5-year intervals when the Ministry reviews company regeneration performance. Successful operation of the FMA's will provide greater precision in wood supply estimates - a matter of critical concern at the present time.

In addition to the reforestation and definition of supply objectives, the FMA's *may* also provide incentives to better utilization of calculated AAC's. A recent draft of a typical FMA includes the provision that "...where the area of a working group that is cut in a year is less than 90 per centum of the total AAC for the working group for the year, the Company agrees to then pay to the Minister, as liquidated damages and not as a penalty, an amount equal to the difference between 90 per centum of the total AAC for the working group for the year and the total volume of timber that is cut in the year for the working group."[3] This proposal closely resembles the *Ontario Committee on Taxation* recommendation discussed in the text of the present chapter. An ambiguity arises however since the 1979 *Forest Management Manual* proposes that the penalty described above is to be paid, not on the AAC itself (less 10 per cent), but on the

[2]Pearse (1976), Chapter 7; Armson (1976), Chapter 3

[3]MNR, *Forest Management Agreement* (draft copy), undated. The amount in question is, of course, additional to stumpage in the acutal harvest.

AAC *minus* the surplus of wood relative to the AAC declared in advance by the company (less 10 per cent).[4] If the company *overcuts* its AAC (*plus* 10 per cent) or its AAC minus declared surplus (*plus* 10 per cent) it must not only pay stumpage on the overcut but must also regenerate the areas involved at its own expense.[5]

The above provisions encourage the companies to adhere closely to the AAC's (or AAC's net of declared surpluses) in their licensed areas by penalizing overcutting and avoiding charges for marginal supplies of fibre within the annual allowable cut. As such they should work to improve utilization as discussed in the body of this chapter.

In general, FMA's imply more intensive forest management with larger silvicultural costs. The success of the FMA's will depend on government funding. In the past, funding of forest management apparently has not been a top priority for the provincial government.

[4]MNR *Forest Management Manual*, December 1979, p.5.14.

[5]Ibid, p.5.14.

CHAPTER 5

ECONOMIC PROSPECTS

SCOPE

Previous chapters have examined markets and prices for Ontario's major forest product exports, relative regional costs of manufacturing and transportation, and the adequacy of the forest resource base in Northern Ontario in relation to existing capacity. The present chapter combines these elements to examine the future prospects for newsprint, kraft pulp and lumber production in the province.

The first task in this chapter will be an examination of after-tax rates of return on new capacity in Ontario, utilizing the pricing and exchange rate discussion of Chapter 2, the cost information from Chapter 3 and the existing tax system (discussed below) under various trend assumptions. As discussed below, projected profitability of new investments in newsprint and kraft pulp facilities is generally satisfactory in relation to capital costs. For new sawmilling capacity, a satisfactory rate of profit relative to capital cost proves to be rather less certain.

Given adequate profitability for new pulp and paper investments in Northern Ontario, the important constraint, as described in Chapter 4, is the wood supply problem. The present chapter recognizes explicitly that the retirement of existing facilities would be necessary to accommodate the construction of new mills if depletion of the forest resource in the province is to be avoided.

With respect to existing capacity in Northern Ontario, this chapter identifies the major "cost problems": high labour costs in the newsprint sector stemming from outdated capital, high wood costs in all sectors of the industry related to accessibility and the use of unionized labour in harvesting operations, and transportation cost disadvantages resulting from rate-making procedures in Canada and the U.S. Only the high level of labour costs in the newsprint sector can be resolved by modernization investments; the rate of profit analysis of the next section will conclude that new newsprint mills offer attractive rates of return under a reasonable

range of assumptions.

The present chapter also examines the consequences of remaining with existing facilities in the future: even without the modernization program currently under way, existing pulp and paper capacity in the province is not under *immediate* economic pressure. The same ranges of prices used to develop the rate of return analysis for *new* capacity are well above unit operating costs for *older* facilities.

The latter observation will be qualified for lumber production. The larger and efficiently operated sawmills in Northern Ontario, which account for the lion's share of capacity, may experience a very narrow margin between prices and unit operating costs under some assumptions. This situation is reflected in the subsequent calculations of possible rates of return on new investment in sawmilling: the low end of this rate of return range will not be found to be sufficiently attractive to warrant new investment in an optimal-sized facility.

RATES OF RETURN ON NEW CAPACITY

Approach

Analysis of investment profitability can take one of two broad approaches. The first approach involves calculation of *financial statement* returns to new investment while the second approach relies on net present value (NPV) or internal rate of return (IROR) concepts.

The financial statement approach is typified by the *simple rate of return on capital* obtained by dividing the projected average annual cash inflow net of average annual depreciation by one-half the initial cost of the investment responsible for the cash flow stream.[1] The simple rate of return and like measures are defective as decision-rules. They ignore the fact that flows occur with specific timing and must be discounted. The *claimed* advantage of financial statement measures of the return on *new* investment is that such measures can be compared with the rate of return on depreciated capital in *on-going* enterprises. Such comparability relies on the assumption that capital in on-going enterprises has been acquired at an approximately uniform rate over time and that prices have been reasonably stable. For present purposes, neither assumption seems valid. Investment in the pulp and

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[1]Thus the simple rate of return on capital is $R = (A-D)/(\frac{1}{2}K)$ where A = average annual cash inflow over the amortization period, D = average annual depreciation, K = initial investment.

paper industry has occurred in bursts (Chapter 1) and much of capital formation took place in the distant past - a half century or more ago. Inflation has produced serious distortions in rates of return on depreciated capital in company balance sheets. From a before-tax perspective, cost depreciation falls significantly short of the replacement cost of capital, first in-first out (FIFO) inventory accounting methods understate the cost of sales, and depreciated capital carried at original cost is valued well below current prices of comparable capital goods. All these effects (and other less significant influences) have artifically increased before-tax rates of return on capital in the 1970's relative to the rates of return experienced during earlier periods. Inflationary exaggeration of before-tax returns to capital has the effect of increasing the level of *real* corporation income taxation, a matter of growing concern to corporate managers and the accounting profession. Corporate income taxes are not yet appropriately indexed to allow for inflationary changes in before-tax profits. In sum, before-tax profit rates are biased upward by inflation, leading to an upward shift in real corporate taxes so that after-tax rates of return reflect countervailing influences: they are exaggerated by the overstatement of before-tax returns but they are also reduced by the increases in corporation taxes brought about by the overstatement of before-tax profits. In a recent study for the Economic Council of Canada, Jenkins estimated that after-tax rates of return on capital in the pulp and paper sector from 1965-1974 in the range of 7-8 per cent overestimated actual rates of return by about 4 per cent.[2]

The inherent timing disadvantages of the financial statement approach to rates of return on capital combined with bunched capital stock changes in the forest products sector and inflationary distortions to profit rates on existing operations have led us to prefer the second broad approach to profitability analysis - one utilizing a net present value or internal rate of return orientation.[3]

In what follows, internal rates of return (discount rates required to equate the present value of projected after-tax cash flows to initial investment outlay) have been calculated

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[2]Jenkins (1977a) Table 4.3 See also Jenkins (1977b).

[3]An increasing proportion of capital budgeting decisions in the pulp and paper industry are being taken with NPV and IROR methods. See Garceau, Papineau, and Schreiber (1979).

for new capacity in newsprint, bleached kraft pulp, and softwood lumber in Northern Ontario. These internal rates of return can be compared to the real cost of capital defined as long-term interest rates on corporate bonds net of the expected rate of inflation. Through most of the 1970's, high-quality industrial bonds in the U.S. and Canada have yielded about 10 per cent with yields exceeding 13 per cent in early 1980. Given the past record of inflation in Canada, annual expected increases in prices can be conservatively estimated at 7 per cent. In *real* terms, therefore, a cost of capital of 6 per cent would be a fairly stringent requirement, particularly when it is recognized that *real* long-term government bond rates (adjusted by the Consumer Price Index) have not risen above 4 per cent in the past eight years and have been negative for part of that period.[4]

Cost And Revenue Assumptions

Chapter 3 has described Northern Ontario as a relatively high cost region for the manufacture of forest products. It cannot be concluded, however, that Ontario is a low profit region without examining internal rates of return on new capacity compared to capital costs, since tax-treatment on new investments can provide important incentives to new facilities. Tables 5.1 through 5.3 summarize the cost and revenue assumptions (from Chapters 2 and 3) that have been used in the internal rate of return calculations.

For newsprint and bleached kraft pulp, real prices are assumed to remain stable in the 1980 dollar ranges shown in the tables over a 20-year investment planning horizon. For softwood lumber, real prices have increased historically at an annual rate of about 1.6 per cent per annum. Accordingly, it has been conservatively assumed that the 1980 prices shown in Table 5.3 for softwood lumber will increase in the range of 1.3 to 1.6 per cent per year over the planning horizon.

New facilities are assumed to be adequately maintained but not technologically altered during the investment horizon. This assumption leads to conservative IROR calculations to the degree that profitable technological changes to the mill over the investment horizon are not included in the present discussion. Depending upon the deflator that is adopted, real

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[4]Royal Bank of Canada (1980), p. 37. A recent internal-rate-of-return study of the Canadian mining industry by MacKenzie and Bilodeau (1979) uses a cost of capital of 8 per cent but points out that this "...represents a 5 per cent risk premium over the 3 per cent historical average cost of capital in the Canadian bond market..." (186).

wages in the forestry and mining sectors have increased at a rate of 3 - 3.5 per cent per annum over the past 20 years. In manufacturing in general, the rate of increase has been from 2.5 - 3.0 per cent over that period.[5] In the absence of productivity improving outlays during the new mill's investment horizon, real wage increases will impart an uptrend to real average unit operating costs as time goes on. Allowing for productivity improvements in harvesting combined with real wage increases and movement to less accessible stands, our basic case sees *wood costs* rising, in real terms, at 2.5 per cent per annum and *labour costs* at mills rising at 3 per cent per annum. With wood costs accounting for about 30 per cent of newsprint average operating cost and mill labour cost accounting for about 15 per cent in a new facility, our basic case allows real operating costs to increase at 1.2 per cent per annum for newsprint over the 20-year planning horizon. Alternate rates of increase of real operating cost were assigned at 1.0 per cent and 1.5 per cent to examine the sensitivity of after-tax real internal rates of return to differences in assumed rates of cost increase. For bleached kraft pulp, the base case for cost increases assumes wood cost at about 50 per cent of total cost and mill labour cost at about 10 per cent of total cost leading to an assumed real rate of increase of operating cost in the range of 1.5 per cent per annum. Sensitivity results included alternate growth rates of 1.3 per cent and 1.7 per cent. With softwood lumber, wood costs were assigned a weight of 63 per cent of cost and labour 17 per cent of cost leading to a base case of 2 per cent per annum real cost increases over the planning horizon. Rates of increase of 1.8 per cent and 2.2 per cent were also used. The assumptions for real rates of cost increase are summarized in Table 5.4. As previously mentioned, the use of rising real costs in the analysis does not imply that real costs per unit of output *must* rise over the planning period, only that they will rise in the absence of additional later outlays to improve productivity. We cannot anticipate the magnitude or timing of such later outlays and therefore opt for the more conservative approach to after-tax rate of return magnitudes implied by the foregoing assumptions.

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[5]Data from Canada: Department of Finance, *Economic Review*, April 1979, reference table 42 wages and salaries deflated by the personal expenditure deflator, the GNE deflator, the CPI, the industry selling price index, and the price index for 30 materials.

Table 5.1

COST AND REVENUE ASSUMPTIONS - NEWSPRINT

1.	Average Unit Operating Cost (1980)	$266 (Can)/short ton
2.	Market Price	$375 - $400 (US)/short ton
3.	Annual Capacity	192,500 short tons/year
4.	Capital Cost	
	Machinery and Equipment (class 29)	$125,000,000 (Can)
	Buildings (class 3)	32,250,000 (Can)
	Land	5,000,000 (Can)
		$162,250,000 (Can)

Sources: Average Unit Operating Cost - Table 3.8; Market Prices - Table 2.12; Annual Capacity - 550 short tons/day at 350 days/year; Capital Cost - Trade literature and industry sources (see also Chapter 3).

Table 5.2

COST AND REVENUE ASSUMPTIONS - BLEACHED KRAFT PULP

1.	Average Unit Operating Cost (1980)	$337.50 (Can)/short ton
2.	Market Price	$435 - $465 (US)/short ton
3.	Annual Capacity	350,000 short tons/year
4.	Capital Cost	
	Machinery and Equipment (class 29)	$200,000,000 (Can)
	Buildings (class 3)	90,000,000 (Can)
	Land	10,000,000 (Can)
		$300,000,000 (Can)

Sources: Average Unit Operating Cost - Table 3.13; Market Prices - Table 2.12; Annual Capacity - 1000 short tons/day at 350 days/year; Capital Cost - Trade literature and industry sources (see also Chapter 3).

Table 5.3

COST AND REVENUE ASSUMPTIONS - SOFTWOOD LUMBER

1. Average Unit Operating Cost (1980)	\$205 (Can)/Mfbm
2. Market Price	\$195 - \$230 (US)/Mfbm
3. Annual Capacity	60,000 Mfbm
4. Capital Cost	
Machinery and Equipment (class 29)	\$13,850,000 (Can)
Buildings (class 3)	4,500,000 (Can)
Land	600,000 (Can)
	\$18,950,000 (Can)

Sources: Average Unit Operating Cost - Table 3.14 and accompanying discussion; Market Price - Table 2.12; Capital Cost - Trade literature and industry sources (see also Chapter 3).

Table 5.4

ASSUMED RATES OF INCREASE OF AVERAGE OPERATING COST

	Low	Base Case	High
Newsprint	1.0%	1.2%	1.5%
Bleached Kraft Pulp	1.3%	1.5%	1.7%
Softwood Lumber	1.8%	2.0%	2.2%

Sources: See discussion in text.

Real pulpwood costs in Ontario remained relatively stable from 1961 to 1976 with the trade literature reporting increases since that time. If real wood costs commenced a 2 per cent annual trend our *lower* bound estimates of total operating cost increases in real terms per annum (1 per cent for newsprint, 1.3 per cent for bleached kraft, and 1.8 per cent for lumber) would be the appropriate cases to examine. Our base case, involving a 2.5 per cent rate of rise of wood costs is, therefore, highly conservative for calculating rates of return on new investments in forest products manufacturing and represents a situation in which scarcity of the raw material becomes a more pressing problem over the next two decades (see Chapter 4 and the section following). Anticipated rates of return would have been noticeably higher, for example, if the assumption was made that real wood costs will remain stable over the investment horizon. In that (optimistic) situation, the appropriate assumptions for the annual rate of increase of real operating cost would have been about 0.5 per cent, 0.35 per cent, and 0.55 per cent for newsprint, kraft pulp, and softwood lumber respectively when real manufacturing wages in these sectors advance at 3 per cent per annum.

The rate of return analysis examines a range of assumed operating rates for new capacity in the Northern Ontario forest products sector. The operating rate has been centred on 90 per cent of capacity with after-tax returns reported for facilities running at 85 and 95 per cent of capacity as well. For Canadian newsprint mills, the average rate of capacity utilization has been 90 per cent from 1960 to 1980 (see also page 40). Canadian kraft pulp mills experienced an average operating rate of 88.7 per cent from 1955 to 1978.[6] Less than immediate price responses and established customer relationships prevent individual facilities from approximating full capacity operation on the average. Periods of rapid capacity growth or weakening markets produce reduced operating rates. In the sawmilling sector, periodic bouts of depressed lumber prices lead to shutdowns as in the spring of 1980. Even in periods of rapid market expansion, growth

[6]Canada: Industry, Trade and Commerce *Review of the Canadian Forest Products Industry*, Table 24.

of capacity in other regions experiencing lower costs than Northern Ontario makes full capacity operation a sometime phenomenon. Readers who predict tight "supply-demand balance" in the future may choose the 95 per cent capacity assumption; conversely belief in a weaker "supply-demand balance" than the historical average would argue for the 85 per cent of capacity projections.

Exchange Rate and Tax Considerations

As discussed in Chapter 2, our own preference regarding the exchange rate is to centre the rate of return projections on rates from $0.85 (U.S.) to $0.90 (U.S.). In the interest of providing a relatively full range of sensitivity results, however, the after-tax internal rates of return on new investments have been calculated and reported for an exchange rate range from $0.80 (U.S.) to $1.00 (U.S.).

For the tax calculations leading to after-tax internal rates of return in real (1980) terms, machinery and equipment are assumed to qualify as class 29 assets subject to capital cost allowances of 50 per cent in the year of acquisition with the balance of capital cost eligible for deduction in any subsequent year.[7] Table 5.5 shows the assumed basis for corporate income taxation. To be conservative, structures and other non-machinery and equipment items have been classified entirely as class 3 assets subject to a 5 per cent declining balance capital cost allowance.[8] Northern Ontario corporations are allowed a 10 per cent *investment tax credit* applied against Federal Taxes payable, a tax credit that can benefit the corporation for up to 6 years including the year in which the qualified property was acquired. The investment tax credit may not exceed the lesser of: i) the corporation's available investment tax credit at the end of the year and, ii) the total of $15,000 plus one-half of any excess of its Federal Tax otherwise payable over $15,000. The investment tax credit reduces the capital cost of the qualified property available

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[7]Some assets could qualify as class 8 assets.

[8]The tax system applicable to new investments has been provided by L. J. Rocco of the Lakehead University School of Business Administration. Mr. Rocco was also involved in initial IROR calculations.

for capital cost allowances for Federal tax purposes. It does *not* have this effect in the calculation of provincial taxes. Present calculations ignore the latter difference, i.e., it is assumed that the investment tax credit *also* reduces the capital cost of qualified property available for capital cost allowances in the calculation of provincial taxes. This simplification is of minor importance - like the classification of all structures as class 3 assets it lends a slightly conservative bias to the rate of return results.

Another minor effect on the calculated IROR's will have been introduced because the 3 per cent inventory allowance deduction has not been included in calculation of taxable income.

Table 5.5

INCOME TAX RATE CALCULATION

		%
Basic Federal Rate		46
less Federal Tax Abatement	10	
Manufacturing & Processing Credit	6	
	16	
		30
plus Provincial Tax Rate		14
Effective Income Tax Rate		44

Source: L.J. Rocco

Findings

Lakehead University's DEC 2020 computer system was used to calculate after-tax internal rates of return under the assumptions described. The program, written and executed by B. C. Beaudreau of the Economics Department, incorporated the tax system along with the cost and revenue assumptions of Tables 5.1 through 5.3, the growth of real operating cost assumptions of Table 5.4, and the alternative operating rate and exchange rate assumptions described above to calculate the discount rate required to equate the present value of the stream of projected after-tax cash flows (over a 20 year horizon) to assumed capital costs for new newsprint, bleached kraft pulp, and softwood lumber mills. Beaudreau's description of the detailed operation of the program appears in an appendix to this Chapter.

The results of the investment analysis appear in Tables 5.6 through 5.11. Tables 5.6 and 5.7 deal with the newsprint cases for assumed real prices of $375 and $400 respectively per short ton. The reference or *basic cases* apply to exchange rates in the $0.85 to $0.90 range in U.S. dollars, a 90 per cent operating rate, and a rate of growth of cost from 1 per cent to 1.2 per cent per annum. When the real price of newsprint is at $375 per short ton in 1980 dollars, the real after-tax rates of return for the basic cases range from 8.7 to 11.8 per cent, well in excess of a cost of capital of 6.0 per cent (in real terms). If the real price of newsprint is higher, at $400 per short ton, the IROR's for the basic cases increase to a range of 11.8 to 14.9 per cent depending upon the precise assumptions.

Within an exchange rate range of $0.85 to $0.90 (U.S.), a decline in the assumed rate of growth of real unit costs by 0.5 per cent from 1.5 per cent to 1.0 per cent raises the after-tax IROR's by about 1 percentage point at a fixed operating rate. Within the same exchange rate range, the IROR's are quite sensitive to shifts in operating rate assumptions: given the rate of growth of real unit cost, a decline in the operating rate from 95 per cent to 85 per cent reduces IROR's by nearly 2 percentage points. The effects of alternative exchange rates on the IROR depends on the other assumptions. At a rate of growth of real unit cost of 1.2 per cent and an operating rate of 90 per cent, the after-tax IROR in a new newsprint mill would be reduced by 8 percentage points from 14.6 per cent to 6.7 per cent if the exchange rate rose from $0.85 (U.S.) to par with newsprint prices stable at $400 per short ton in 1980 dollars.

Table 5.6

NEWSPRINT - IROR RESULTS AT $375 (US)/SHORT TON
(1980 DOLLARS) (PER CENT, AFTER - TAX)

Exchange Rate (Can $ equals:)	Operating Rate	IROR when real unit cost grows at: 1.5%	1.2%	1.0%
$1.00	95%	3.0%	4.1%	4.7%
1.00	90%	2.4%	3.5%	4.1%
1.00	85%	1.8%	2.8%	3.4%
$ .95	95%	5.9%	6.8%	7.3%
.95	90%	5.2%	6.0%	6.5%
.95	85%	4.5%	5.3%	5.8%
$ .90	95%	8.9%	9.6%	10.0%
.90	90%	8.0%	8.7%	9.1%
.90	85%	7.2%	7.9%	8.3%
$ .85	95%	11.8%	12.4%	12.7%
.85	90%	10.9%	11.5%	11.8%
.85	85%	9.9%	10.5%	10.8%
$ .80	95%	15.0%	15.4%	15.7%
.80	90%	13.9%	14.4%	14.7%
.80	85%	12.8%	13.3%	13.6%

Source: B. C. Beaudreau.

Table 5.7

NEWSPRINT - IROR RESULTS AT $400 (US)/SHORT TON
(1980 DOLLARS) (PER CENT, AFTER - TAX)

Exchange Rate (Can $ equals:)	Operating Rate	IROR when real unit cost grows at:		
		1.5%	1.2%	1.0%
$1.00 (US)	95%	6.7%	7.5%	8.0%
1.00	90%	5.9%	6.7%	7.2%
1.00	85%	5.1%	5.9%	6.4%
$ .95	95%	9.4%	10.0%	10.5%
.95	90%	8.6%	9.2%	9.6%
.95	85%	7.7%	8.4%	8.8%
$ .90	95%	12.2%	12.8%	13.1%
.90	90%	11.3%	11.8%	12.1%
.90	85%	10.3%	10.8%	11.2%
$ .85	95%	15.2%	15.7%	15.9%
.85	90%	14.1%	14.6%	14.9%
.85	85%	13.0%	13.5%	13.8%
$ .80	95%	18.2%	18.6%	18.8%
.80	90%	17.1%	17.5%	17.7%
.80	85%	15.9%	16.3%	16.6%

Source: B. C. Beaudreau.

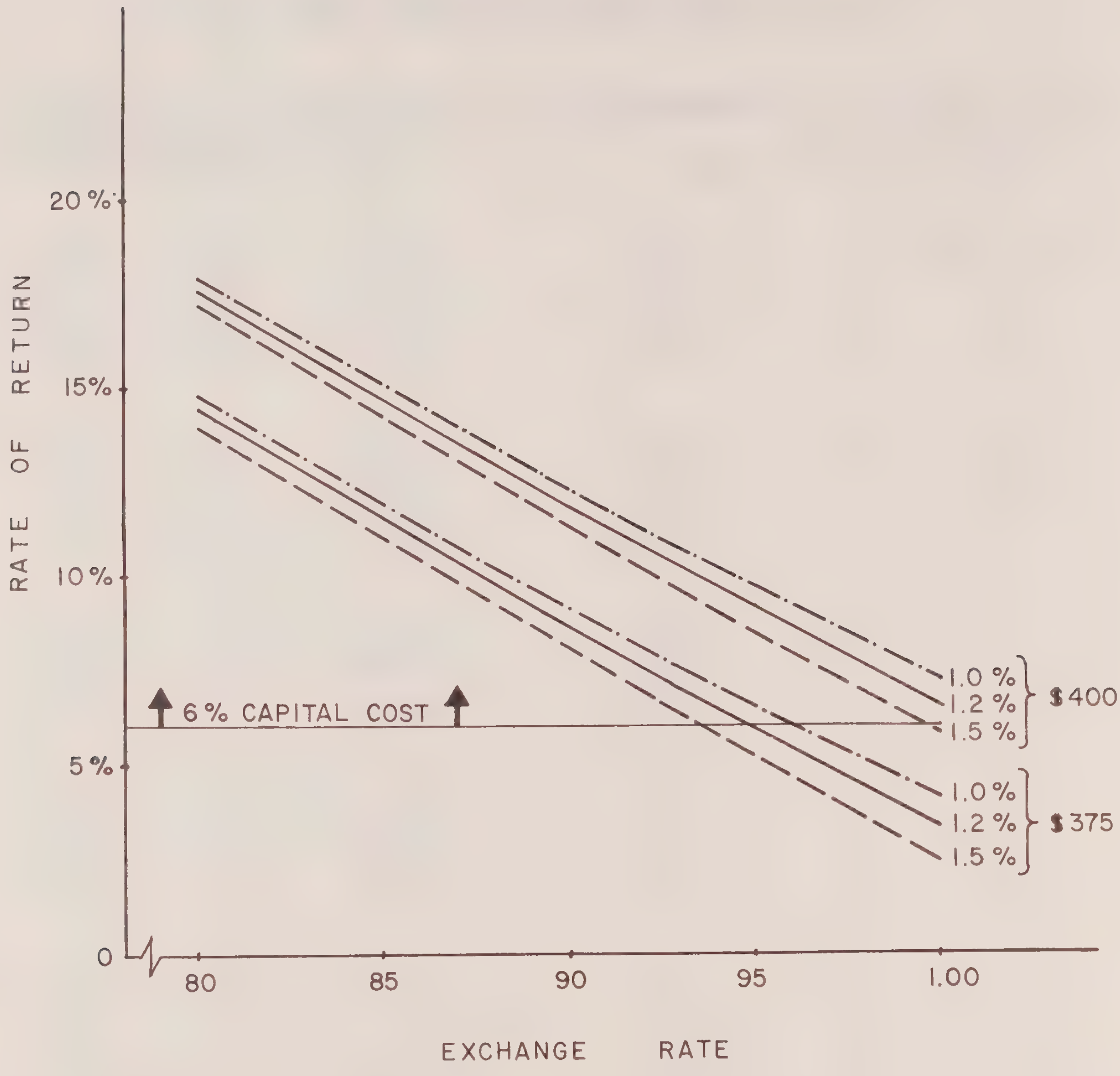

CHART 5.1 NEWSPRINT RATES OF RETURN
(OPERATING RATE = 90%)

SOURCE: TABLES 5.6 & 5.7

Rates of return to new newsprint facilities are only unfavourable when quite pessimistic assumptions are made: exchange rates in the $0.95 to $1.00 range combined with the low U.S. dollar price of newsprint, low operating rates, and high rates of growth of real (1980 dollar) unit costs. Chart 5.1 illustrates the data in Tables 5.6 and 5.7 for an assumed operating rate of 90 per cent of capacity. With a cost of capital of 6 per cent in real terms and a 90 per cent average operating rate, new newsprint capacity can be justified up to an assumed exchange rate of $0.95 or $1.00 depending upon the real price of newsprint assumed.

Tables 5.8 and 5.9 refer to new capacity in bleached kraft pulp. For kraft pulp, the *basic cases* apply again to the exchange rate range of $0.85 to $0.90 with an operating rate of 90 per cent. The price range is from $435 (U.S.) per short ton to $465 (U.S.). For the *basic cases*, the after-tax IROR lies in the range of 5.5 to 14.2 per cent - a rather wide range of results compared to the tighter range for newsprint. Comparable assumptions produce somewhat lower rates of return for bleached kraft than for newsprint in our analysis. At a 6 per cent cost of capital, most of the basic cases generate favourable prospects, the exceptions occurring at an exchange rate of $0.90 (U.S.) combined with the lower 85 per cent operating rate, the rapid unit cost growth assumption and the low price assumption. For exchange rates above $0.90 (U.S.), the higher price assumption would usually be required to produce an internal rate of return in excess of the reference cost of capital.

Regarding sensitivity, a change of 0.4 percentage points in the unit cost assumption alters the expected internal rates of return by 1 to 1.5 percentage points for the *basic cases*. With the exchange rate in the $0.85 to $0.90 range, an operating rate decline from 95 per cent to 85 per cent reduces the IROR's by about 2 percentage points at the $465 1 short ton real price level and by 1.5 to 2.0 percentage points at $435. As with newsprint, rates of return are quite sensitive to the exchange rate assumed with much larger proportional responses for the low price cases. Chart 5.2 illustrates the sensitivity results for an assumed operating rate of 90 per cent of capacity. In general, the exchange rate levels that equate the kraft pulp internal rates of return to the assumed 6 per cent cost of capital occur about 5¢ lower than for newsprint, at $0.90 (U.S.) and $0.95 (U.S.) rather than $0.95 (U.S.) and par.

Table 5.8

BLEACHED KRAFT PULP - IROR RESULTS AT $435 (US)/SHORT TON (1980 DOLLARS) (PER CENT, AFTER - TAX)

Exchange Rate (Can $ equals:)	Operating Rate	IROR when real unit cost grows at:		
		1.7%	1.5%	1.3%
$1.00 (US)	95%	(4.1%)	(1.6%)	0.2%
1.00	90%	(4.8%)	(2.1%)	(0.5%)
1.00	85%	(5.4%)	(2.7%)	(1.0%)
$ .95	95%	2.0%	3.2%	4.2%
.95	90%	1.3%	2.6%	3.2%
.95	85%	0.5%	1.8%	2.8%
$ .90	95%	6.3%	7.0%	7.7%
.90	90%	5.5%	6.2%	6.9%
.90	85%	4.7%	5.5%	6.1%
$ .85	95%	10.1%	10.7%	11.2%
.85	90%	9.2%	9.8%	10.3%
.85	85%	8.3%	8.8%	9.4%
$ .80	95%	14.0%	14.5%	14.9%
.80	90%	12.9%	13.4%	13.8%
.80	85%	11.8%	12.3%	12.7%

Source: B. C. Beaudreau.

Table 5.9

BLEACHED KRAFT PULP - IROR RESULTS AT $465 (US)/SHORT TON
(1980 DOLLARS) (PER CENT, AFTER - TAX)

Exchange Rate (Can $ equals:)	Operating Rate	IROR when real unit cost grows at: 1.7%	1.5%	1.3%
$1.00 (US)	95%	3.4%	4.4%	5.2%
1.00	90%	2.7%	3.7%	4.5%
1.00	85%	1.9%	3.0%	3.8%
$ .95	95%	7.1%	7.9%	8.5%
.95	90%	6.3%	7.0%	7.7%
.95	85%	5.5%	6.2%	6.9%
$ .90	95%	10.7%	11.3%	11.8%
.90	90%	9.8%	10.3%	10.8%
.90	85%	8.8%	9.4%	9.9%
$ .85	95%	14.4%	14.8%	15.2%
.85	90%	13.3%	13.8%	14.2%
.85	85%	12.2%	12.6%	13.1%
$ .80	95%	18.1%	18.5%	18.8%
.80	90%	16.8%	17.1%	17.4%
.80	85%	15.6%	16.0%	16.3%

Source: B. C. Beaudreau.

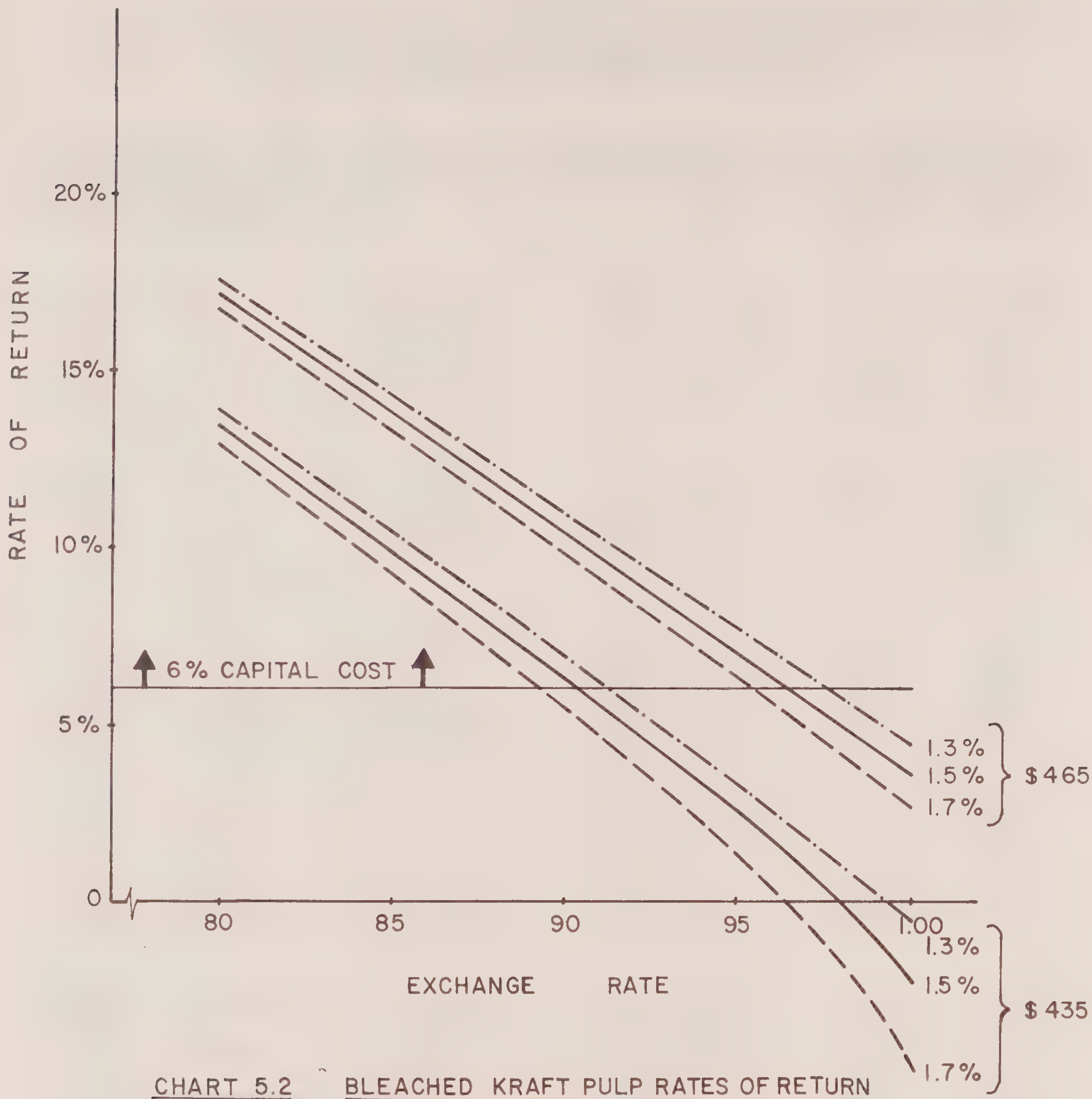

CHART 5.2 BLEACHED KRAFT PULP RATES OF RETURN
(OPERATING RATE = 90%)

SOURCE TABLES 5.8 & 5.9

In the case of softwood lumber capacity, we have adopted a price range centred on $212.50 (U.S.)/Mfbm as a mid-point between $195 and $ 230/Mfbm and examined possible growth trends for this price of 1.3 per cent and 1.6 per cent per annum. Tables 5.10 and 5.11 show the results of the analysis. Since lumber prices are highly volatile over the short-run, the results for the 1.3 per cent growth rate have been reported for a $195/Mfbm and $230/Mfbm range around the $212.50/Mfbm average. These results are reported in Table 5.12 for the 90 per cent operating rate assumption.

Internal rates of return in the lumber sector are generally lower than for bleached kraft pulp or newsprint on the assumptions employed here. Indeed, with U.S. dollar prices commencing in the $212.50/Mfbm range and rising at 1.3 per cent to 1.6 per cent in real terms, the range of real unit cost increases assumed suggests that a capital cost of 6 per cent can only be met by new sawmills if the exchange rate remains in the $0.84 to $0.88 range throughout the 20-year horizon. Depending upon the specific cost-price assumptions employed, new capacity may or may not provide a 6 per cent rate of return: if real prices grow at 1.3 per cent and real costs grow at 2.2 per cent, the exchange rate must remain at or below $0.84 (U.S.) to return 6 per cent while real prices growing at 1.6 per cent and real costs growing at 1.8 per cent will provide a 6 per cent return or greater at exchange rates up to about $0.875 (U.S.).

The results reported in Tables 5.10 and 5.11 together with Chart 5.3 do not provide sensitivity information for variations in the initial (1980) U.S. dollar price of lumber. Variations around the average of $212.50 (U.S.)/Mfbm do, however, lead to significant changes in the after-tax internal rate of return. This variability is illustrated in Table 5.12 for exchange rates of $0.85 (U.S.) and $0.90 (U.S.) with the real prices growing at 1.3 per cent and is representative of the sensitivity involved. The real price is centred in $212.50/Mfbm and allowed to take on values of $195/Mfbm and $130/Mfbm. The operating rate in Table 5.12 is 90 per cent and the rate of growth of real unit cost is 2 per cent. These results illustrate the risks involved in capital investment when product prices are highly volatile: when the exchange rate is at $0.85, a permanent drop in lumber prices from $230/Mfbm to $195/Mfbm converts an attractive internal rate of return of 12 per cent after-tax to a negative value.

Table 5.10

SOFTWOOD LUMBER - IROR RESULTS AT $212.50 (US)/Mfbm
GROWING AT 1.3% PER ANNUM (1980 DOLLARS) (PER CENT, AFTER - TAX)

Exchange Rate (Can $ equals:)	Operating Rate	IROR when real unit cost grows at: 2.2%	2.0%	1.8%
$1.00 (US)	95%	(65.3%)	(55.3%)	(42.6%)
1.00	90%	(65.9%)	(55.9%)	(43.2%)
1.00	85%	(66.5%)	(56.5%)	(43.8%)
$ .95	95%	(20.9%)	(14.1%)	(7.0%)
.95	90%	(21.7%)	(14.8%)	(7.6%)
.95	85%	(22.5%)	(15.5%)	(8.3%)
$ .90	95%	(3.1%)	(0.3%)	1.8%
.90	90%	(3.5%)	(0.8%)	1.3%
.90	85%	(3.8%)	(1.3%)	0.7%
$ .85	95%	4.8%	6.1%	7.2%
.85	90%	4.1%	5.4%	6.6%
.85	85%	3.4%	4.7%	5.9%
$ .80	95%	10.7%	11.5%	12.3%
.80	90%	9.8%	10.6%	11.4%
.80	85%	8.9%	9.8%	10.5%

Source: B. C. Beaudreau. The large negative IRORs at high exchange rates occur in the context of mill shutdowns owing to an excess of unit operating cost over price.

Table 5.11

SOFTWOOD LUMBER - IROR RESULTS AT $212.50 (US)/Mfbm
GROWING AT 1.6% PER ANNUM (1980 DOLLARS) (PER CENT, AFTER - TAX)

Exchange Rate (Can $ equals:)	Operating Rate	IROR when real unit cost grows at:		
		2.2%	2.0%	1.8%
$1.00 (US)	95%	(49.4%)	(34.4%)	(15.5%)
1.00	90%	(50.0%)	(35.0%)	(15.9%)
1.00	85%	(50.6%)	(35.6%)	(16.4%)
$ .95	95%	(10.3%)	(3.5%)	(0.9%)
.95	90%	(10.6%)	(4.0%)	(1.2%)
.95	85%	(11.6%)	(4.6%)	(1.5%)
$ .90	95%	1.1%	2.9%	4.3%
.90	90%	0.5%	2.3%	3.7%
.90	85%	0.0%	1.7%	3.1%
$ .85	95%	7.0%	8.0%	8.9%
.85	90%	6.3%	7.3%	8.2%
.85	85%	5.6%	6.6%	7.5%
$ .80	95%	12.2%	12.9%	13.6%
.80	90%	11.3%	12.0%	12.7%
.80	85%	10.4%	11.1%	11.8%

Source: B. C. Beaudreau. The large negative IRORs at high exchange rates occur in the context of mill shutdowns owing to an excess of unit operating cost over price.

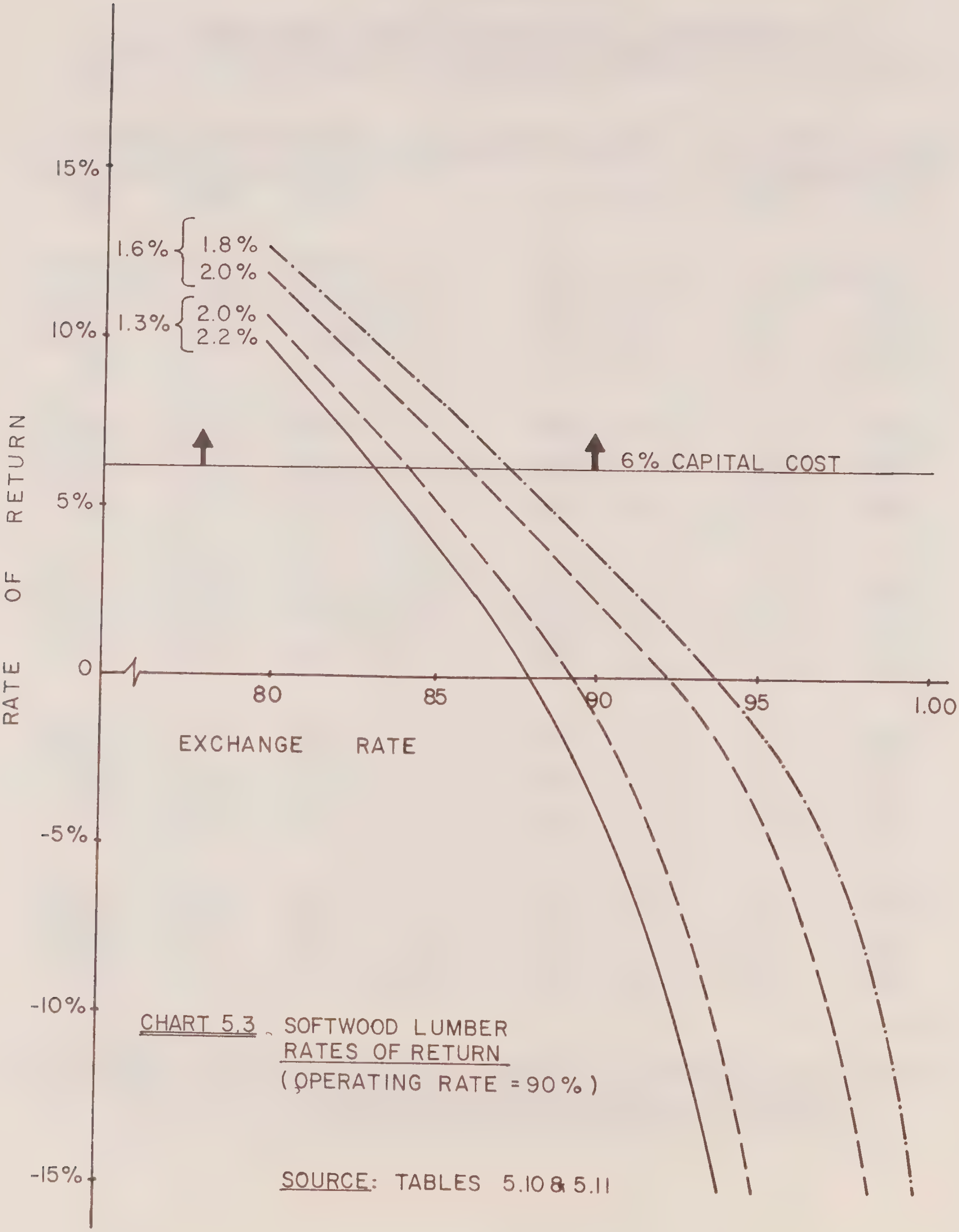

CHART 5.3 SOFTWOOD LUMBER RATES OF RETURN (OPERATING RATE = 90%)

SOURCE: TABLES 5.10 & 5.11

Table 5.12

SOFTWOOD LUMBER - SAMPLE RATE OF RETURN SENSITIVITY
TO INITIAL PRICE ASSUMPTIONS*

Exchange Rate	Prices	IRORs (% after - tax)
$ .90	$195.00 (US)	(34.0)
.90	212.50 (US)	(0.8)
.90	230.00 (US)	7.2
$ .85	$195.00 (US)	(5.7)
.85	212.50 (US)	5.4
.85	230.00 (US)	12.0

*1980 price of softwood lumber per Mfbm assumed to be growing at 1.3% per annum. Real unit costs growing at 2.0% per annum. Operating rate at 90% of annual capacity.

Source: B. C. Beaudreau.

Our conclusion with respect to softwood lumber is that, beginning at price levels representative of healthy markets, new capacity offers rates of return that are satisfactory at the present exchange rate range of about $0.85 (U.S.). At higher exchange rates, new capacity is not attractive and the level of risk attached to lumber prices can be an important impediment to investment decisions in this sector.

- With the exchange rate in the $0.85 to $0.90 (U.S.) range, greenfield investments in newsprint and bleached kraft pulp manufacturing can achieve satisfactory rates of return in relation to the real cost of capital in Ontario.

- With the same exchange rate range, new investments in softwood lumber manufacturing capacity offer rates of return that barely cover capital costs. In addition, volatile prices for lumber produce special investment risks in this sector.

- Both the foregoing general conclusions are framed in the context of real wood costs in Ontario rising more rapidly than in the past.

THE WOOD SUPPLY CONSTRAINT

The essential conclusion of Chapter 4 was that existing industrial wood requirements equal or exceed the sustained level of supply from Northern Ontario's forest resource. This tight situation has emerged principally as a result of growth in kraft pulp and lumber capacity over the past ten or fifteen years. Chapter 4 stressed relationships between sustained allowable cuts and industrial requirements for Northern Ontario as a whole and for sub-regions of Northern Ontario. Scarcity can also be viewed in terms of actual harvests relative to the land base allocated to the production of industrial wood. Harvests of 11-12 cunits per acre on Crown land are representative of the Ontario average.[9] Without

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[9]Chapter 4, f.n.4.

any change in utilization standards, declining allowable cuts over the next 20 years as over-mature volumes are removed and cutting shifts to lower yield areas, could lead to a harvest of 10 cunits per acre or less. With industrial fibre requirements of 7.1 million cunits annually (Table 4.5), the total *required* annual cutover could increase to over 700,000 acres per year by the end of the century without additions to capacity in the Northern Ontario forest products sector. If a 100 year growing period continues to be representative of Northern Ontario forest rotations, sustained production of wood equal to current 'normal' requirements will require about 70 million acres of productive forest land devoted to fibre production. Referring to Table 4.6, this is about 15 per cent *more* than the 61 million acres of land area allocated for production at the present time.

The perception of adequate rates of profit in manufacturing operations in Northern Ontario is certainly a necessary condition for new capacity. But, unless wood costs accurately reflect fibre scarcity, *sustained* capacity increases in Northern Ontario can only take place if the resource base is adequate. This is not to suggest that *temporary* increases are impossible. If long-run scarcity signals are not transmitted to private decision-makers in the forest products sector, capacity could grow by large amounts in the near-term followed by capacity contraction in the next century. This has been an inevitable occurrence for localized non-renewable resources. It has also characterized the exploitation of forest resources in Canada, the United States, and Western Europe in the past. The Eastern Canadian lumber industry, the northern U.S. lumber and pulp industries, and the Scandinavian forest products industries all offer historical examples of the mining of a renewable resource with increases in industrial capacity followed by resource depletion and capacity retrenchment.[10] Unified (Crown) management of the Northern Ontario forest base makes it possible to avoid near-term expansion followed by long-term contraction, but Crown management does not *guarantee* it. As Chapter 4 pointed out, scarcity has to be transmitted to private decision-makers through limitations on harvest volumes (utilization remaining constant) and total areas to be harvested if sustained production is the social goal. An ever-present (and natural) danger is that Crown forest managers will continue to espouse the *theory* of sustained capacity while, at the same time, being

[10] See Lower (1938); Hunter (1955); Randers and Høsteland (1979) among a host of references.

pressured to permit expansions of existing manufacturing facilities. Once such facilities are in place, a downward adjustment of fibre supply to reflect sustained yields becomes much more difficult: defence of present employment levels has a strong tendency to over-ride the threat of future resource depletion. In any trade-off between short-run and long-run goals, the latter are *very* heavily discounted. This is particularly true when long-run fibre supplies are so difficult to define with precision and the existing stock of the resource is a large multiple of its periodic growth increment. Sustained yield requires more than the support of professional foresters if it is not to succumb to the lure of short-run job creation.

- If sustained yield exploitation of the forest resource is the goal of the people of Ontario, the existing demand-supply situation requires a restraint on mills' wood demands. Additional manufacturing capacity should only be installed if existing facilities can be adapted (through higher pulping yields or wood chip use or greater hardwood utilization) or retired to free up wood currently required by the industry at 'normal' operating levels.

Not only are sustained yield wood supplies fully utilized or over-utilized in the aggregate, there presently exists a serious mismatch between supplies and requirements of softwoods and hardwoods in Northern Ontario. 'Normal' requirements indicate that only 6-7 per cent of requirements take the form of northern hardwood species (principally poplars). Northern Ontario's allowable cut, on the other hand, is approximately 33 per cent composed of hardwoods, leading to a considerable excess supply of these species. This is reflected, in part, in the low rate of utilization of hardwoods in the logging process. As the previous chapter suggested, incentives should be intensified to promote substitution of hardwoods for softwoods. Indeed, such substitution is *essential* if current softwood requirements are not to substantially outrun sustained softwood supplies.

Paucity of data makes it difficult to confirm a mismatch between available sawtimber supplies and sawlog requirements. The Ministry of Natural Resources does not distinguish between sawlogs and other wood fibre in its allowable cut estimates. The minimum size of timber required for sawing will depend on distance from the sawmill, lumber and chip prices, sawmill costs, and the types of equipment installed

at the sawmills.[11] It is certainly inappropriate to assume that availability of wood in a particular geographical area translates into sawmill supplies.[12] Reported scarcities of sawtimber - even granted the smaller sizes now considered eligible for 2x4 lumber production - warns against such an assumption. Sawmill concentration in specific locations compounds the problem of availability. Whatever the actual supply position for particular facilities, the overall tightness of wood supplies in Northern Ontario means that any expansion of lumber capacity would require reductions in pulp capacity to avoid additional stress on aggregate supplies of fibre in the near future.

The movement of logging activity away from the more accessible areas of the province means that satisfaction of existing 'normal' industrial requirements will lead to increasing wood costs as the productivities of factors of production engaged in the harvesting and wood delivery phases of the industry are adversely affected by wood location and the areal density of wood supplies. A recent discussion paper prepared by Environment Canada comments that: "Place or location is a particularly relevant circumstance in forestry. Some firms are harvesting their wood 500 or more kilometres from their mills. Cost of transportation has increased substantially and will continue to rise. Costs exceeding $20 per m^3...{$57 per cunit}... are not unknown and may become common. As a rule of thumb, additional trucking costs alone would be $5 per m^3...{$14 per cunit}... for each additional 100 km."[13] The reduced areal fibre density in the regions of Northern Ontario north of areas now under regular harvest was noted in the previous chapter (see Table 4.12 and accompanying discussion). With negligable harvesting activity in Reed Region 1 and Benson's potentially exploitable area, costs of remote wood supplies are clearly difficult to estimate, particularly when terrain conditions are variable and the private-public mix of cost sharing for transportation facilities and logging camps is not known in advance. Even with adequate access and logging camp facilities, wood harvested one hundred miles north of areas currently being cut-

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[11] Reed (1980), Chapter 5.

[12] Peat Marwick and Partners (1979), Chapter 6. In their study, expansion of lumber production is *assumed* to be possible if wood is available in the aggregate.

[13] Environment Canada - *Federal Policy in the Canadian Forestry Sector*, (Dec. 1979), unpaginated.

over with volumes per acre equal to half present volumes could easily cost an additional $30/cunit in transportation and harvesting expenditures. Chapter 3 reported pulpwood costs (at mills) in Northern Ontario in the range of $90 to $97 per cunit so that heavy reliance on remote fibre supplies would clearly add significantly to the province's wood costs - already higher than in other Northern American forest regions.

Naturally, the movement of logging into the northern areas will occur only gradually and with gradual reductions in the harvest volume per acre. High marginal wood costs will be rolled into the costs of more accessible wood so that average wood costs (in 1980 dollars) will never rise to the level that would prevail if all fibre was sourced from remote areas - indeed this would be quite impossible from the standpoint of the physical availability of wood in these areas (Table 4.10) relative to provincial requirements. Nevertheless, harvesting operations will inevitably move northward over the coming decades before returning to more accessible locations. Wood costs will therefore rise inexorably from this cause alone in addition to any other factors operating to increase them. Such projected increases have been included in the assumptions of the previous section.

The appearance of new capacity in Northern Ontario would hasten the industry's shift to high-cost wood supplies in addition to preventing the realization of long-term sustained yield from the resource. If constructed at the optimal scales described in Chapter 3, greenfield facilities would place large incremental demands on Ontario's forests. Export-oriented new capacity for kraft pulp would have an optimal scale of about 1000 short tons per day while optimal scales for newsprint and lumber are about 550 short tons per day and 60 million board feet per annum respectively. Using the conversion factors for wood requirements in Chapter 4 (Tables 4.4 and 4.5), a new kraft facility at optimum scale would require about .6 million cunits of fibre annually, while new newsprint and lumber operations (at their optimal scales) would require about .18 million cunits per year and .12 million cunits per year respectively.

Existing mills in Northern Ontario *do* face cost disadvantages in spite of the generally satisfactory rates of return to incremental capacity described in the last section. The next section analyzes, in detail, the reasons for such cost disadvantages as a prelude to examining the competitive viability of existing capacity.

COST PROBLEMS FOR EXISTING MILLS

The derivation of production costs in Chapter 3 indicates that existing producers of newsprint and dried bleached softwood kraft pulp located in Northern Ontario face higher costs than do the majority of producers located in other important production regions.

It is clearly not appropriate to reduce production costs in the various regions to the level of a single average cost estimate. Although this procedure would greatly simplify an analysis of regional cost differences, it would be a violation of observed reality. Every region has high and low cost producers and in many instances the deviation in costs from the mean is significant. For this reason, it is necessary to look at production costs over a representative range.

Newsprint

With respect to the production of newsprint from existing capacity, it is clear that producers located in Northern Ontario are at a considerable disadvantage compared with producers located in the U.S. southeastern states. With an assumed value for the Canadian dollar of $1 Canadian = $.875 U.S., the cost of production - excluding depreciation - in the various regions in U.S. dollars per short ton of newsprint is as follows:

Northern Ontario	Quebec	S.E. U.S.A.
$261-$308	$240-$285	$223-$255

With the range of costs derived in Chapter 3, the majority of producers located in Northern Ontario would require an exchange rate of $1 Canadian = $.75 U.S. in order to be in the same cost range as producers in the U.S. Southeast.

The reasons for the higher cost of production in Northern Ontario are essentially threefold. First, and the area over which producers have greatest control, is the level of labour costs. At an exchange rate of $1 Canadian = $.875 U.S. the cost for labour services per ton of newsprint in U.S. $ in Northern Ontario varies between $67 and $101, whereas in the southeastern U.S. the appropriate range is only $43 to $65. It must be noted that the difference in labour costs between the two regions is *not* related directly to regional wage rate variations. Rather, it is the result of differences in the required levels of labour *inputs* in the two regions. It was shown in Chapter 3 that the bulk of existing capacity in the U.S. Southeast is of relatively recent vintage, in sharp

contrast to the situation prevailing in Northern Ontario. In consequence, the majority of mills in Northern Ontario require significantly more labour input per ton of newsprint than do mills in the U.S. Southeast. In order to reduce required labour inputs to a more acceptable level, large capital expenditures are required. It should be noted that the cost of a modern twin-wire paper machine, for example, is approximately \$23 to \$25 million dollars and that the cost of installation and the purchase of auxillary equipment will more than double this amount. However, because the expenditure is related to class 29 assets, the capital cost is subject to the highly beneficial accelerated depreciation allowance described earlier. By itself, capital investment aimed at securing reductions in operating costs will only succeed in placing Northern Ontario producers at the upper level of the range of costs experienced by producers in the U.S. Southeast.[14]

Wood costs in Northern Ontario are considerably in excess of those enjoyed by newsprint producers located in the U.S. Southeast. The question of course arises as to whether or not existing Northern Ontario producers have any significant degree of control over the level of wood costs. It must be recognized that a large proportion of wood supplied to mills in the U.S. Southeast is cut by unorganized workers in areas where other job opportunities are limited. Contractors, apparently, have little trouble in hiring woods labour at wage rates in the \$5 to \$6 per hour range. In addition, most workers thus employed receive only those fringe benefits mandated by law. This, of course, is in sharp contrast to the situation in Northern Ontario where woods labour is generally unionized and where fringe benefits and wage rates are considerably in excess of those prevailing in the U.S. Southeast.

The use of independent contract cutting is less prevalent in Northern Ontario than it is in much of the rest of Eastern Canada. Companies supplying data on wood costs all indicated that the cost of wood sourced from independent contractors was 25 to 35 per cent lower than wood sourced from company operations. The difference in cost was in part due to the lower fringe benefit and overhead costs faced by independent

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[14] It is difficult to provide estimates of the reduction in operating costs that can be secured by modernization programmes, since such reductions are very plant specific. However, large scale modernization programmes of the type currently being undertaken by some major producers suggest a reduction in operating costs, in 1980 dollars, of \$45 to \$60 (Canadian) per ton.

contractors and to the reportedly higher productivity enjoyed by the independent contractors. This last point is almost impossible to corroborate because of the complete absence of published data. It is, however, a view that was advanced by a large number of company representatives.[15]

The question arises as to why, if companies believe that independent contractors are able to lay down wood in the yard at a substantial saving over company cutting operations, the use of independent contractors has not been expanded. Part of the answer to this may be found in the continuing confrontation between Boise Cascade Canada Ltd. and Local 2693 of the Lumber and Sawmill Workers Union. Essentially, Local 2693 did not wish to see the continuation/expansion of a provision in the agreement that allowed union members to purchase skidders and supply the company with wood as owner-operators. Even though persons opting to be owner-operators would remain as union members, the union was adamantly opposed. Equally adamant, the company insisted that a union member could, *if he so desired*, become an owner-operator and work on a piecework basis: In April 1979, the company contracted its harvesting and delivery out to independents.[16] In brief, the potential advantage of perceived long term reductions in real wood costs may only be attainable with considerable added short run costs.

The third major source of higher costs for Northern Ontario producers as compared with producers located in the U.S. Southeast, is the cost of transporting newsprint from the mill to market. It must, however, be clearly understood that the level of rail rates on newsprint exports from Eastern Canada to the United States - and for that matter on newsprint movements within Canada - is almost totally beyond the control of newsprint producers.

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[15]The following quotation fairly summarizes the view of companies who do source wood from independent contractors. "It has definitely been proven that it costs the owner-operator less to operate his machine because of the pride of ownership and the incentive to observe proper maintenance and operating procedures. Of course, it goes without saying that owner-operators are better producers." *(Canadian Pulp and Paper Industry*, December, 1979).

[16]Company Press Release.

Rail freight rates in Canada, and to a lesser extent in the United States, are determined on the basis of a value for service pricing principle, that is, whatever the traffic will bear. The result of this is that rail rates in Canada vary considerably across commodities and across routes in a manner that is unrelated to the cost of providing the transportation services. To a large extent, competition from water and highway carriers determines the levels of freight rates for a large volume of commodities. Thus if the rail carrier faces competition on a given route for the movement of a commodity such as newsprint or pulp, the rate will be set lower than in the absence of such competition.

Two of the major complaints by newsprint producers as to the level of rail rates have been directed at:[17]

- the disadvantage faced by Eastern Canadian mills shipping into traditional U.S. markets *vis-a-vis* rates faced by mills located in the U.S. South.

- the cost borne by newsprint (and pulp) producers in the form of higher rates as rail carriers recoup the loss entailed in moving grain under the statutory grain rates.

The first point has been discussed in detail in Chapter 3, where it was shown that newsprint producers in much of Eastern Canada - especially Quebec producers - are at a relative disadvantage as compared to southern producers. It was also indicated that this disadvantage can be expected to grow in the near future. The major reasons for this are that southern rail carriers are in a better financial position than are carriers in the U.S. Northeast and Midwest and that southern carriers also face greater competition from other modes than do carriers in the Northeast and Midwest. In consequence, rates on south-originating rail traffic will be lower than will rates on traffic originating in the Northeast or Midwest.

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[17]See for example, Canadian Pulp & Paper Association (1979).

It is difficult to discern any existing regulatory remedy that newsprint producers could take advantage of to gain relief from this situation. Previous attempts to argue the case before the Interstate Commerce Commission and the Canadian Transport Commission have not been successful. (Nor, it may be added, have they attracted a great deal of sympathy from the regulatory bodies.) In any case, appeals for regulatory relief are believed to be extremely expensive and very time consuming. (The newsprint case referred to in Chapter 3 began in May 1970 and a decision was not rendered until the end of 1975.)

With regard to the question of whether or not rail carriers are using newsprint and pulp rates (and rates on many other commodities) to cross-subsidize the losses incurred on statutory grain movements, the answer is in the affirmative. A large portion of the loss incurred by the rail carriers on the movement of grain will be borne by rail traffic which displays a relatively inelastic demand for rail transportation with respect to rail rates.[18] To the extent that the demand for rail transportation for newsprint (and pulp) movements is relatively inelastic with respect to rates, producers of these commodities will face higher rates than in the absence of losses on grain traffic. However, the impact on the pulp and paper industry is impossible to determine.

Kraft Pulp

Producers of dried bleached kraft pulp located in Northern Ontario are at a cost disadvantage compared with producers located in other major producing regions. With an assumed value for the Canadian dollar of $1 Canadian = $.875 U.S., estimated production costs in U.S. $ in the various regions - excluding depreciation charges - are as follows (per air dry ton of pulp):[19]

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[18] See Bonsor (1977), p.85.

[19] The figure reported for British Columbia interior mills is an average one. Clearly, costs *will* vary across individual mills. However, deviations from the mean may not be very large since important components of cost are relatively uniform across mills. In addition, most mills are large and modern.

Northern Ontario	Quebec	S.E. U.S.A.	British Columbia (Interior)
\$294-\$360	\$284-\$364	\$246-\$294	\$260

In general, Northern Ontario and Quebec are relatively high cost locations compared with the U.S. Southeast and the interior of British Columbia. The reason for this is almost solely related to differences in wood costs.

- In Northern Ontario, wood costs account for 43 to 45 per cent of kraft pulp production costs, whereas in the U.S. Southeast they account for only 31 to 32 per cent of production costs.

- The wood cost component gives producers in the U.S. Southeast an advantage over Northern Ontario producers of \$60 to \$70 per air dry ton of pulp, assuming \$1 Canadian = \$.875 U.S. The advantage in wood costs enjoyed by B.C. interior producers is even greater.

- The ability of Northern Ontario producers of kraft pulp to achieve reductions in components of cost other than wood cost is, in general, more limited than is the case for newsprint producers. Much of the reason for this is that the bulk of kraft pulp capacity in Northern Ontario is of relatively modern vintage. In the case of older mills, producers may be able to achieve significant reductions in operating costs by modernization programmes.

Pollution Abatement

All Northern Ontario (and U.S.) pulp and paper mills will be required to invest significant amounts of capital over the next ten years for pollution abatement procedures. In Ontario, the actual costs of complying with standards set by the Ontario Ministry of the Environment are very difficult to calculate. Unlike the situation in the United States, where the Environmental Protection Agency has a set of definitive regulations covering permissible levels of various emissions, the Ontario regulatory framework does not provide a set of mill-wide mandatory standards. In brief, rather than setting maximum levels for the discharge of pollutants, the Ministry of the Environment operates with "flexible" standards. For example, the discharge of effluents into water bodies is regulated, in part, according

to the believed absorptive capacity of the water body receiving the effluent flow. Thus, a mill on a water body such as Lake Superior may well be allowed to discharge a greater amount of mill effluent than will mills located on a much smaller body of water.

The required abatement procedures at individual mills are also determined, apparently, by the perceived ability of the company to undertake the cost of emission control. In short, permissible levels of discharge are in part subject to negotiation between the company and the Ministry. Added to this has been the non-compliance with required procedures actually established by the Ministry. A recent Ontario Government report by the Special Task Force on Ontario's Pulp and Paper Industry (1978) states that

> "This differential record of compliance cannot be allowed to persist in the future. The Control Orders established by MOE have been tailored to the conditions at each individual mill and incorporate only proven technology. Accordingly, the Task Force urges that the legal requirements set out in the current Control Orders be fully enforced in terms of substance and timing."[20]

The above report provides some initial estimates of the cost involved in meeting near term (1979-1983) and long term (up to 1990) emission standards on an individual mill basis. The most difficult problem is that of achieving acceptable effluent control in mills using a sulphite process. As an example, Cowan (1977) estimates that the cost of installing a recovery boiler, with pulp washing and evaporation, would be of the order of $30 million. Given the limited output of such plants, the cost of production would be increased dramatically.

The cost of meeting the near term pollution standards was estimated to cost $124.7 million and the cost of meeting longer term goals an estimated additional $231 million.[21]

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[20]Ontario Ministry of Industry and Tourism (1978), p.12.

[21]Ontario Ministry of Industry and Tourism (1978), p.12. Discussions with Ministry officials indicate that dispersion standards set by the International Joint Commission (I.J.C.) will require an additional $5 to $10 million for affected mills.

Clearly, not all of the above expenditures will produce a zero return to the industry. In many instances, the expenditures required for pollution abatement procedures will also lead to savings in production costs. For example, the installation of recovery boilers in kraft pulp mills will not only reduce the amount of discharged effluents but will also lead to a significant reduction in energy costs. In many instances, especially in the oldest mills, capital expenditures on pollution abatement procedures are inextricably linked with expenditures for plant modernization.

A recent study by the U.S. Bureau of the Census (1979) indicates that pollution abatement procedures entailed operating costs for pulp and paper mills in the U.S. in 1977 of $288 million.[22] Producers, however, recovered $87 million dollars of this sum in the sale or internal use of materials and energy reclaimed through abatement activities. No estimates are available on the value of productivity improvements flowing from abatement activities.

It should be noted that pollution abatement standards faced by American mills are considerably more stringent than those placed on Ontario mills. A confidential report on operating costs estimates that newsprint mills in the U.S. South incurred a cost, in 1978, of $4 per ton of newsprint over and above that incurred by mills in Eastern Canada for pollution control. Landegger (1980) estimates that the additional capital investment required for meeting environmental standards for new kraft mills in the U.S.A. is approximately $10 to $15 million above that required in Canada.

Lumber

We have indicated in previous chapters that there are essentially two types of sawmill operations in Northern Ontario: mills with relatively large scale capacity selling output in major markets in Southern Ontario, the Northeast U.S. and the U.S. Midwest, and secondly, mills of small capacity serving specialized or local markets. It was shown in Chapter 3 that mills with a capacity of less than 60 million board feet a year had higher production costs than did mills with a capacity in the 60 to 70 million board feet a year range.

[22]This excludes payments related to the use of public sewers. The estimate does, however, include $75.4 million for depreciation costs.

For sawmills in Northern Ontario with a capacity of 60 to 70 million board feet a year, production costs (including the cost of transporting output to market) are within the range of \$169 to \$189 U.S. It was indicated in Chapter 3 that the above costs are higher than those faced by efficient producers in British Columbia and the U.S. Southeast.

The major cost problem faced by Northern Ontario producers is that of obtaining an adequate supply of sawlogs at a net wood cost that does not lead to uneconomically high production costs. If net wood costs for Northern Ontario producers increase at a faster rate in real terms than do net wood costs in other lumber producing regions, the probable long-run result will be that Northern Ontario producers will be increasingly marginal in major existing markets.

THE VIABILITY OF EXISTING CAPACITY

The fact that Northern Ontario is a high cost location for the manufacture of newsprint, dried kraft pulp and lumber does not necessarily preclude the continuing viability of existing capacity.

Over the life length of the fixed capital assets employed in production processes, existing producers will continue to remain in operation as long as revenue is sufficient to cover all of the variable costs. In the long run, of course, the replacement of existing capacity will only be undertaken if investment in new plant and equipment promises an adequate rate of return on capital (see above).

It is, of course, exceedingly difficult to form accurate projections for market prices of any given group of products. In addition, it is equally difficult to project a set of costs for the inputs that are required in the production process. However, the question of whether or not existing capacity will be economically viable rests firmly on the relationship between market prices and production costs.

The delivered price assumptions given in Table 2.12 will be used as the upper and lower bounds for market prices for this analysis. These, together with the current market prices and operating costs, are shown in Table 5.13. It can be seen that in the case of newsprint and kraft pulp, all producers located in Northern Ontario are covering all of their variable costs. Indeed, the excess of price over average

variable cost for even the high cost producers of newsprint and kraft pulp is equal to $168 and $101 per ton respectively. It is equally clear that the recent sharp drop in lumber prices has placed lumber producers in Northern Ontario near or below the shut-down point.

Table 5.13

DELIVERED PRICES AND COSTS

	Newsprint (Can.$/Short Ton)	Bleached Kraft Pulp (Can.$/Short Ton)	Softwood Lumber (Can.$/Mfbm)
Low Price	$429	$497	$223
Existing Price*	$460	$512	$196-$210
High Price	$457	$531	$263
Current Operating Cost	$299-$352	$337-$411	$193-$217

*Existing prices have been converted at an exchange rate $1 Can. = $.869 U.S., whereas projected prices are based on an exchange rate $1 Can. = $.875 U.S. The lumber price is that prevailing in April in major markets for 2x4 50% 16', partially air dry Eastern spruce and jackpine.

Given the assumed range of market prices for newsprint and kraft pulp, it is apparent that, in 1980 dollars, existing capacity is viable. It is of course possible to present a number of radically different sets of assumptions with respect to the behaviour of real operating costs. If costs in Northern Ontario locations increase at the same rate as the overall level of inflation, and if operating rates in both sectors hold up relatively well, then production even at the low market price projection will be highly profitable. However, if the cost of production in Northern Ontario increases at a rate faster than the general level of inflation and market prices are "stuck" at the low end of the projected bound, a point can be reached where some existing capacity becomes uneconomic. This may occur if there are large additions to capacity in low cost regions, coupled with large

increases in the real cost of major production inputs in Northern Ontario locations. If additions to capacity occur in the low cost regions at a rate faster than the rate of increase in market demand, pressure is exerted to forestall increases in market prices. Hence, if costs in Northern Ontario are increased at a faster rate than prices, some producers may approach a shut-down point.

With respect to lumber production, it can be expected that market prices in the short-run may well be outside the bounds indicated in Table 5.13. Clearly, lumber producers face the real probability of short term shut-downs (and short term periods of very high profits). Within the range of the projected average market prices, it is apparent that efficient producers can, with their existing structure of costs, remain viable in the short run. In 1980 dollars, the projected low market price coupled with current production costs in 1980 dollars, implies that existing producers can avoid a shutdown situation. However, if costs increase at a faster rate than the general level of inflation and if prices gravitate to the low end of the projected range, lumber producers in Northern Ontario face the distinct possibility of finding continued operation uneconomic.

CONCLUSIONS

- There can be no doubt that the overvalued exchange rate for the Canadian dollar in the mid-1970's placed considerable strain on the Ontario forest products sector. The subsequent depreciation of the dollar has greatly improved the competitive position of existing facilities as well as rates of return on completely new capital investments in the three manufacturing processes studied in this report.

- Wood supplies in the province of Ontario are not adequate to support increased capacity in forest products manufacture. Accordingly, favourable rates of return - particularly for new investments in newsprint and kraft pulp mills - should be taken as signals to renovate existing facilities. Renovation or replacement is especially important for out-dated newsprint mills experiencing much higher costs than facilities in the southern United States. The analysis of the present study reveals that replacement of existing news-print capacity with entirely new capacity offers

rates of return well above the cost of capital for such investments. This conclusion has implications for government assistance programs directed to the forest products industry.

- Ontario's major cost problems are centred on wood costs at present and in the future and on transportation costs to traditional markets. Higher wood costs relative to southern U.S. competitors are partly the result of greater unionization in Ontario's harvesting sector and partly the result of deteriorating access to merchantable timber. Transportation cost differentials are partly due to location and partly due to rate-setting procedures by Canadian and U.S. railroads.

- Satisfactory competitive performance of the Ontario forest products sector in the future rests crucially on relative unit cost developments. Assuming that a recurrence of the recent over-valuation of the Canadian dollar can be avoided in the future, it is important that unit costs in the Ontario forest products sector not grow in excess of unit costs in the U.S. southern forest products sector expressed in Canadian dollars. From 1970 to 1979, average hourly earnings in Ontario pulp and paper rose by about the same percentage as average hourly earnings in U.S. pulp and paper *when the depreciation of the Canadian dollar is taken into account* (see Table 3.2).

- The adverse experience of the forest products industry in the mid-1970's illustrates the importance of securing an exchange rate that reflects relative Canadian and U.S. unit cost differentials in domestic currencies. Large variations in capital flows caused by Canadian-U.S. interest rate differentials can create serious competitive problems for our major export industries. If, for example, large capital inflows were to raise the value of the Canadian dollar to par at present, investment opportunities and current profitability would be seriously impaired in Ontario's forest products industries.

APPENDIX 5-A

A FORESTRY PROGRAM OF I.R.O.R. SENSITIVITY ANALYSIS FOR THE NORTHERN ONTARIO PULP AND PAPER INDUSTRY

This appendix is intended to provide a concise overview of the actual program used in Chapter 5 to perform sensitivity analysis of the internal rate of return in the three designated sectors - newsprint, kraft pulp, and softwood lumber. The programming language used was the Digital Equipment Corporation's (D.E.C.) version of Fortran IV.

The approach adopted here will be to delineate the following five (5) distinct program parts, and then proceed to describe each in some detail.

1. Cash-Flow Determination
2. Net Cash-Flow Subroutines
3. Tax Credit - Tax Rate Subroutines
4. Actual Computation of I.R.O.R.
5. Investment Tax Credit Control Mechanism.

CASH-FLOW DETERMINATION

Lines 00000 to 00255 effectively generate a number of cash flows, each the result of a varying exchange rate and/or a varying operating rate. Lines 140 to 149 generate prices and unit cost vectors for the 20 year period over which the firm amortizes its initial investment. Lines 150 and 210 show the use made of the DO-loop feature, which allows for the generation of various exchange rate - operating rate scenarios, which in turn, comprise the basis for the sensitivity analysis conducted in Chapter 5. Lines 225 to 255 bring together the prices, exchange rate, unit cost, and operating rate vectors into a cash-flow profile spanning 20 years.

NET CASH-FLOW SUBROUTINE

Line 00257 transfers control over to the indicated subroutines at which point capital consumption allowances, both on

class 29 and on class 3 assets, are netted from the before-tax cash flows to produce net cash flows which are then returned to the calling program. Control is then transferred to line 00650.

TAX CREDIT - TAX RATE SUBROUTINES

Line 00650 transfers control to the indicated subroutines. The *Cred* subroutine performs a number of operations which include the computation of taxes payable, the allowable investment tax credit, net taxes payable, and the ratio of after to before tax cash-flows which it then returns to the calling program along with the sum totals of the claimed investment tax credits.

ACTUAL COMPUTATION OF I.R.O.R.

Lines 00660 to 00970 comprise the actual I.R.O.R. calculation which in essence can be looked upon as an iterative approach to the determination of the I.R.O.R. An initial value is specified, and the corresponding present value is computed. The latter is then compared to the initial capital costs (see lines 910-937 inclusive) and the internal rate of return adjusted in the appropriate manner until an I.R.O.R. is reached which is such that the differences between the *present value* and the *initial capital cost* is less than or equal to $1,000. The I.R.O.R. is then reported along with the present value, the exchange rates, and the operating rate.

INVESTMENT TAX CREDIT CONTROL MECHANISM

The I.T.C. is, by design, intended to allow firms a credit on taxes payable up to a *minimum* of 10 per cent of initial capital costs (class 29 and class 3). However, a combination of a low operating rate and high exchange rate can produce cash flows which are such that the firm does not generate sufficient taxable income over the eligibility period to take *full* advantage of the allowable tax credit. A Control Mechanism was therefore designed to transfer CCA's (class 29) out of years 6, 5, 4, 3 and into years 7, 8, 9, 10, thereby generating taxable income in the earlier years against which the I.T.C. can be claimed. The C.C.A.'s were transferred in discrete amounts of $1 million. Once transferred, the I.R.O.R. was recalculated, and the results reported. The Control Mechanism would proceed to transfer CCA's until the sum total of I.T.C.'s was equal to the allowable amount, at which point control would be returned to the program.

The results were conclusive: in all cases the I.R.O.R. increased as more taxes were generated in years 6, 5, 4; however, it would appear that there exists an optimum amount - in terms of the I.R.O.R. - of I.T.C. which firms ought to claim. This amount is, in many cases, less than the maximum allowable amount.

```
      DIMENSION Q(100), L(100), S(100),RT(20),TXC(20)
      DIMENSION YF(20),P(20),C(20),RYF(20),XC(20)
      DIMENSION NCF(20),Z(20),UC(20),TCF(20),T(20)
      DIMENSION NT(20),V(20),AB(20),BX(20)
      REAL W
      AMTR=500000.00
      J=1
      R=0.046
      X=60000.00
      DO 55 K=1,20
      P(K)=267.32*((1.010)**K)
      UC(K)=201.38*((1.0)**K)
      TYPE 450,P(K),UC(K)
   55 CONTINUE
      DO 25 N=0,20
      E=1.00/(1.00-(N/100.00))
      DO 25 M=5,15
      W=(1.00-(M/100.00))
      DO 30 K=1,20
      YF(K)=(P(K)*E-UC(K))*X
      RYF(K)=YF(K)*W
      TYPE 450,YF(K),RYF(K)
   30 CONTINUE
      CALL TAX(RYF,C,Z,NCF)
      GO TO 45
   46 IF(C(6).GT.AMTR.AND.NCF(7)-C(7).GT.AMTR) GO TO 70
      IF(C(6).GT.AMTR.AND.NCF(8)-C(8).GT.AMTR) GO TO 71
      IF(C(6).GT.AMTR.AND.NCF(9)-C(9).GT.AMTR) GO TO 72
      IF(C(6).GT.AMTR.AND.NCF(10)-C(10).GT.AMTR) GO TO 73
      IF(C(5).GT.AMTR.AND.NCF(7)-C(7).GT.AMTR) GO TO 74
      IF(C(5).GT.AMTR.AND.NCF(8)-C(8).GT.AMTR) GO TO 75
      IF(C(5).GT.AMTR.AND.NCF(9)-C(9).GT.AMTR) GO TO 76
      IF(C(5).GT.AMTR.AND.NCF(10)-C(10).GT.AMTR) GO TO 77
      IF(C(4).GT.AMTR.AND.NCF(7)-C(7).GT.AMTR) GO TO 78
      IF(C(4).GT.AMTR.AND.NCF(8)-C(8).GT.AMTR) GO TO 79
      IF(C(4).GT.AMTR.AND.NCF(9)-C(9).GT.AMTR) GO TO 91
      IF(C(4).GT.AMTR.AND.NCF(10)-C(10).GT.AMTR) GO TO 92
      IF(C(3).GT.AMTR.AND.NCF(7)-C(7).GT.AMTR) GO TO 93
      IF(C(3).GT.AMTR.AND.NCF(8)-C(8).GT.AMTR) GO TO 94
      IF(C(3).GT.AMTR.AND.NCF(9)-C(9).GT.AMTR) GO TO 95
      IF(C(3).GT.AMTR.AND.NCF(10)-C(10).GT.AMTR) GO TO 96
      IF(C(2).GT.AMTR.AND.NCF(7)-C(7).GT.AMTR) GO TO 97
      IF(C(2).GT.AMTR.AND.NCF(8)-C(8).GT.AMTR) GO TO 98
      IF(C(2).GT.AMTR.AND.NCF(9)-C(9).GT.AMTR) GO TO 99
      IF(C(2).GT.AMTR.AND.NCF(10)-C(10).GT.AMTR) GO TO 101
      IF(C(1).GT.AMTR.AND.NCF(7)-C(7).GT.AMTR) GO TO 102
      IF(C(1).GT.AMTR.AND.NCF(8)-C(8).GT.AMTR) GO TO 103
      IF(C(1).GT.AMTR.AND.NCF(9)-C(9).GT.AMTR) GO TO 104
      IF(C(1).GT.AMTR.AND.NCF(10)-C(10).GT.AMTR) GO TO 105
      GO TO 25
   70 C(6)=C(6)-AMTR
      C(7)=C(7)+AMTR
      GO TO 45
```

```
   71 C(6)=C(6)-AMTR
      C(8)=C(8)+AMTR
      GO TO 45
   72 C(6)=C(6)-AMTR
      C(9)=C(9)+AMTR
      GO TO 45
   73 C(6)=C(6)-AMTR
      C(10)=C(10)+AMTR
      GO TO 45
   74 C(5)=C(5)-AMTR
      C(7)=C(7)+AMTR
      GO TO 45
   75 C(5)=C(5)-AMTR
      C(8)=C(8)+AMTR
      GO TO 45
   76 C(5)=C(5)-AMTR
      C(9)=C(9)+AMTR
      GO TO 45
   77 C(5)=C(5)-AMTR
      C(10)=C(10)+AMTR
      GO TO 45
   78 C(4)=C(4)-AMTR
      C(7)=C(7)+AMTR
      GO TO 45
   79 C(4)=C(4)-AMTR
      C(8)=C(8)+AMTR
      GO TO 45
   91 C(4)=C(4)-AMTR
      C(9)=C(9)+AMTR
      GO TO 45
   92 C(4)=C(4)-AMTR
      C(10)=C(10)+AMTR
      GO TO 45
   93 C(3)=C(3)-AMTR
      C(7)=C(7)+AMTR
      GO TO 45
   94 C(3)=C(3)-AMTR
      C(8)=C(8)+AMTR
      GO TO 45
   95 C(3)=C(3)-AMTR
      C(9)=C(9)+AMTR
      GO TO 45
   96 C(3)=C(3)-AMTR
      C(10)=C(10)+AMTR
      GO TO 45
   97 C(2)=C(2)-AMTR
      C(7)=C(7)+AMTR
      GO TO 45
   98 C(2)=C(2)-AMTR
      C(8)=C(8)+AMTR
      GO TO 45
   99 C(2)=C(2)-AMTR
      C(9)=C(9)+AMTR
      GO TO 45
  101 C(2)=C(2)-AMTR
      C(10)=C(10)+AMTR
      GO TO 45
  102 C(1)=C(1)-AMTR
      C(7)=C(7)+AMTR
      GO TO 45
  103 C(1)=C(1)-AMTR
      C(8)=C(8)+AMTR
      GO TO 45
  104 C(1)=C(1)-AMTR
      C(9)=C(9)+AMTR
```

```
       GO TO 45
   105 C(1)=C(1)-AMTR
       C(10)=C(10)+AMTR
    45 CALL CRED(RYF,C,Z,RT,XC,AB,T,V,TXC)
     1 DO 10 I=1,20
       L(I)=(RYF(I)*RT(I))/((1.00+R)**I)
       TYPE 450,L(I)
       Q(0)=000000.00
       Q(I)=Q(I-1)+L(I)
       TYPE 450,Q(I)
    10 CONTINUE
       J=J+1
       CC=18950000.00
       IF(J.GT.40000) GO TO 26
       TYPE 450,R
       IF(ABS(CC-Q(20)).LT.1000.00) GO TO 3
       IF(ABS(CC-Q(20)).EQ.1000.00) GO TO 3
       IF(CC-Q(20).GT.1000000.00) GO TO 4
       IF(CC-Q(20).LT.-1000000.00) GO TO 2
       IF(CC-Q(20).GT.100000.00) GO TO 11
       IF(CC-Q(20).LT.-100000.00) GO TO 12
       IF(CC-Q(20).GT.10000.00) GO TO 13
       IF(CC-Q(20).LT.-10000.00) GO TO 14
       IF(CC-Q(20).GT.1000.00) GO TO 15
       IF(CC-Q(20).LT.-1000.00) GO TO 16
       GO TO 3
     2 R=R+.01
       GO TO 1
     4 R=R-.01
       GO TO 1
    11 R=R-.001
       GO TO 1
    12 R=R+.001
       GO TO 1
    13 R=R-.0001
       GO TO 1
    14 R=R+.0001
       GO TO 1
    15 R=R-.00001
       GO TO 1
    16 R=R+.00001
       GO TO 1
     3 TYPE 400,Q(20),XC(7),R,J,I,W,Q(1),E
       IF(XC(20).LT.1835000.00) GO TO 46
    25 CONTINUE
    26 PRINT 450,J,R,Q(20),E,W,C(1)
   400 FORMAT(12X,F15.4,2X,F15.4,2X,F9.7,2X,I6,2X,I2,2X,F8.6
          1,2X,F14.2,2X,F8.6)
   450 FORMAT(10X,G,1X,G,1X,G,1X,G,1X,G,1X,G,1X,G)
       STOP
       END
       SUBROUTINE TAX(RYF,C,Z,NCF)
       DIMENSION Z(20),NCF(20),SCF(20),C(20)
       DIMENSION F(20),RYF(20)
       DC=0.90*13850000.00
       SCF(0)=0.00
       CD=0.90*4500000.00
       DO 100 I=1,20
       Z(I)=(0.05)*CD*(0.95**I)
       NCF(I)=RYF(I)-Z(I)
       SCF(I)=SCF(I-1)+NCF(I)
       F(I)=SCF(I)-DC
       IF(F(I).LT.0) C(I)=NCF(I)
       IF(F(I).EQ.0) C(I)=NCF(I)
```

```
      IF(F(I).GT.0.AND.F(I).LT.NCF(I)) C(I)=DC-SCF(I-1)
      IF(F(I).EQ.NCF(I).OR.F(I).GT.NCF(I)) C(I)=0.00
  100 CONTINUE
      RETURN
      STOP
      END
      SUBROUTINE CRED(RYF,C,Z,RT,XC,AB,T,V,TXC)
      DIMENSION RYF(20),C(20),Z(20),RT(20),XC(20)
      DIMENSION TXC(20),NT(20),TCF(20),T(20)
      DIMENSION V(20),AB(20),BX(20)
      DO 80 I=1,20
      V(I)=C(I)+Z(I)
      AB(I)=RYF(I)-V(I)
      T(I)=(0.44)*AB(I)
      XC(I)=XC(I-1)+TXC(I-1)
      IF(XC(I).LT.1835000.00) GO TO 81
      GO TO 82
   81 IF(I-6)83,83,82
   83 TXC(I)=(0.34)*T(I)
      BX(I)=BX(I-1)+TXC(I)
      IF(BX(I).GT.1835000.00) TXC(I)=1835000.00-XC(I)
   82 NT(I)=T(I)-TXC(I)
      RT(I)=1-(NT(I)/RYF(I))
   80 CONTINUE
      RETURN
      STOP
      END
```

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GLOSSARY AND CONVERSIONS

a.d.t. - air-dry ton involving 10% moisture and 90% bone-dry fibre.

Acre - 1 acre = .405 hectares or .0016 square miles.

b.d.t. - bone-dry ton (no moisture).

CEDED - a five stage bleaching sequence involving initial treatment with chlorine followed by two successive treatments with chlorine dioxide.

CTMP - chemi-thermomechanical pulp (chemical pre-treatment).

Cord - 1 cord equals approximately .85 cunits in Northern Ontario.

Cubic Foot - 1 cubic foot = .028 cubic metres.

Cunit - 1 cunit equals 100 cubic feet of solid wood.

Cunits/Acre - 1 cunit per acre = 7 cubic metres per hectare.

D_CEDED - a five stage bleaching sequence involving initial treatment with chlorine dioxide and chlorine followed by two successive treatments with chlorine dioxide.

fbm - board foot measure; 1 fbm = 12"x 12"x 1".

FT - finished ton (short ton).

Greenfield Operation - new pulp or pulp and paper capacity constructed at a new site.

Kraft Pulp - chemical pulp using sodium hydroxide and sodium sulfide at temperature in the 160° C to 170° C range followed, for bleached kraft pulp, by a bleaching sequence. Also referred to as Sulphate Pulp.

Mfbm - 1000 fbm.

MMfbm - 1 million fbm.

Short ton or ton - .907 metric tons (tonnes).

Sulphate Pulp - Kraft Pulp.

TMP - thermomechanical pulp.

COMMENTS

FROM MEMBERS OF

THE ADVISORY COMMITTEE

Government of Canada | Gouvernement du Canada
Regional Economic Expansion | Expansion Économique Régionale

Rec'd Nov. 4/81

Ottawa, Ontario
K1A OM4

October 16, 1981

Commissioner J.E.J. Fahlgren
Royal Commission on the Northern
Environment
Manulife Centre
55 Bloor Street West
Toronto, Ontario
M4W 1A5

Dear Commissioner Fahlgren:

Having examined a draft copy, dated February 1981, of the report "The Economic Future of the Forest Products Industry in Northern Ontario", I would like to make a few comments regarding the authors' conclusion that the rates of return as estimated in the study have "major implications for government assistance programs directed to the forest products' industry". As it now stands the statement is ambiguous and somewhat misleading.

First of all it should be emphasized that the vast majority of the forestry industry projects that are assisted by DREE are not greenfield projects but are modernizations/ renovations to existing facilities. For such projects the estimated rates of return for greenfield sites outlined in the study are not relevant and have very little "implication for government assistance programs". Modernizations/renovations to part of an existing plant generally involve higher capital costs than those quoted for greenfield sites due to higher installation costs, disruption of production while renovations are proceeding, etc. Investments for pollution abatement often show negligible or even negative rates of return to capital as they involve additional costs for the firm but add very little in the way of additional revenues. Rates of return are certainly not ignored in analyses concerning the provision of government financial assistance to private sector firms for specific capital projects, but it is the rate of return for each specific project that is important and not the rate of return for a hypothetical greenfield plant.

...2

Secondly, project rates of return are only one of many criteria that can be and are used to determine if assistance is to be provided to a proposed investment project. Within DREE very thorough and comprehensive commercial and economic assessments are conducted for projects that could involve considerable government expenditure, and any proposal for a greenfield newsprint plant, or greenfield pulp mill, or even large modernizations would be and are subjected to such analyses. These assessments involve analyses of markets, the business policy and strategy of the firm requesting assistance, capital and operating costs of the proposed project, technological feasibility of the project, and the proposed financing of the project. The findings of these analyses form not only a set of data that are invaluable in reaching a decision regarding government financial assistance for a project, but also serve as inputs into a financial analysis of the project. The financial analysis usually entails the development of pro forma balance sheets, operating statements, and expected cash flows. The expected rate of return for the specific project being examined is then obtained.

In addition to a commercial analysis, a comprehensive benefit-cost analysis of the project is also conducted to measure the net economic benefits generated by the project to ensure that the nation will obtain a positive economic benefit in exchange for governmental financial assistance. In other words, when private sector firms come to the federal government for assistance for a large project whether in the forest products industry or any other industry, a very thorough commercial and economic analysis is conducted to ensure that assistance is required, to ensure that positive socio-economic benefits are generated by the project and are at least as great as the value of the assistance provided, and to ensure that with assistance the project will be a viable commercial operation which will provide permanent long-lasting employment for the people in the communities affected.

Although this has been somewhat of a technical comment, I believe it is rather important to indicate that the

actual project rates of return are not ignored in examinations of project proposals for government assistance, but they are only one of many measures that are employed in arriving at a recommendation regarding the desirability of providing assistance for a project.

Sincerely,

R. G. Fletcher

R.G. Fletcher
Manager, Economic Research
and Analysis
Project Assessment and
Evaluation Branch

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November 10, 1981

Mr. I. S . Fraser,
Director of Research,
Royal Commission on the Northern Environment,
Manulife Centre,
55 Bloor Street West, Room 801,
Toronto, Ontario.
M4W 1A5

Dear Mr. Fraser: Re: Study on Forest Products Industry

As stated in my letter of August 14, I am in general in favour of the revised 'Final Draft' of the Lakehead University study.

There is however one vitally important point respecting raw material supply which has not been sufficiently high-lighted. I refer to the competition for wood supplies between the pulp and paper companies and what are usually called the "independent sawmills". The study has tended to focus upon such physical elements as currently available timber volumes, rate of growth, and maximum allowable cut, as well as prospects for regeneration and cost of production and transport.

The hotly competitive struggle for wood supplies might be viewed by some simply as a fact of history and of the present, without necessarily being considered an essential component of the economic backdrop against which the future forest products industry will have to operate.

In my opinion, taking into account the policy under which timber concession and timber volume agreements are now being allocated, the 'major problems and prospects' - (see PREFACE p. iii) of the industry will be greatly influenced - often adversely, because of this struggle for raw material.

The facet of the problem was mentioned at least twice during Steering Committee meetings, but apparently was not considered important enough for closer examination by the Study Team.

In order that we be fully informed of those factors influencing the future development and prospects of both the pulp and paper and lumber segments of the industry respectively, THERE SHOULD BE A THOROUGH STUDY OF THE WHOLE SYSTEM AND PRACTICE OF TIMBER LICENSE ALLOCATIONS IN NORTHERN ONTARIO.

In the Northern region of this province I believe that the development of the independent sawmill industry will fall far short of its potential unless a more rational system of timber allocation is implemented.

Sincerely yours,

JWMcN/B

The Royal Commission on the Northern Environment actively solicits public response and commentary on all aspects of its research and public program.

Commentary, critique and review are welcomed on The Economic Future of the Forest Products Industry in Northern Ontario. A Summary of Public Response to this report is scheduled for public release in April, 1982.